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# SHIP RESEARCH AND DEVELOPMENT CENTER

Bethesda, Maryland 20034



## THE CONVERGING FACTORS FOR THE FRESNEL INTEGRALS

by

John W. Wrench Jr.

and

Vicki Alley

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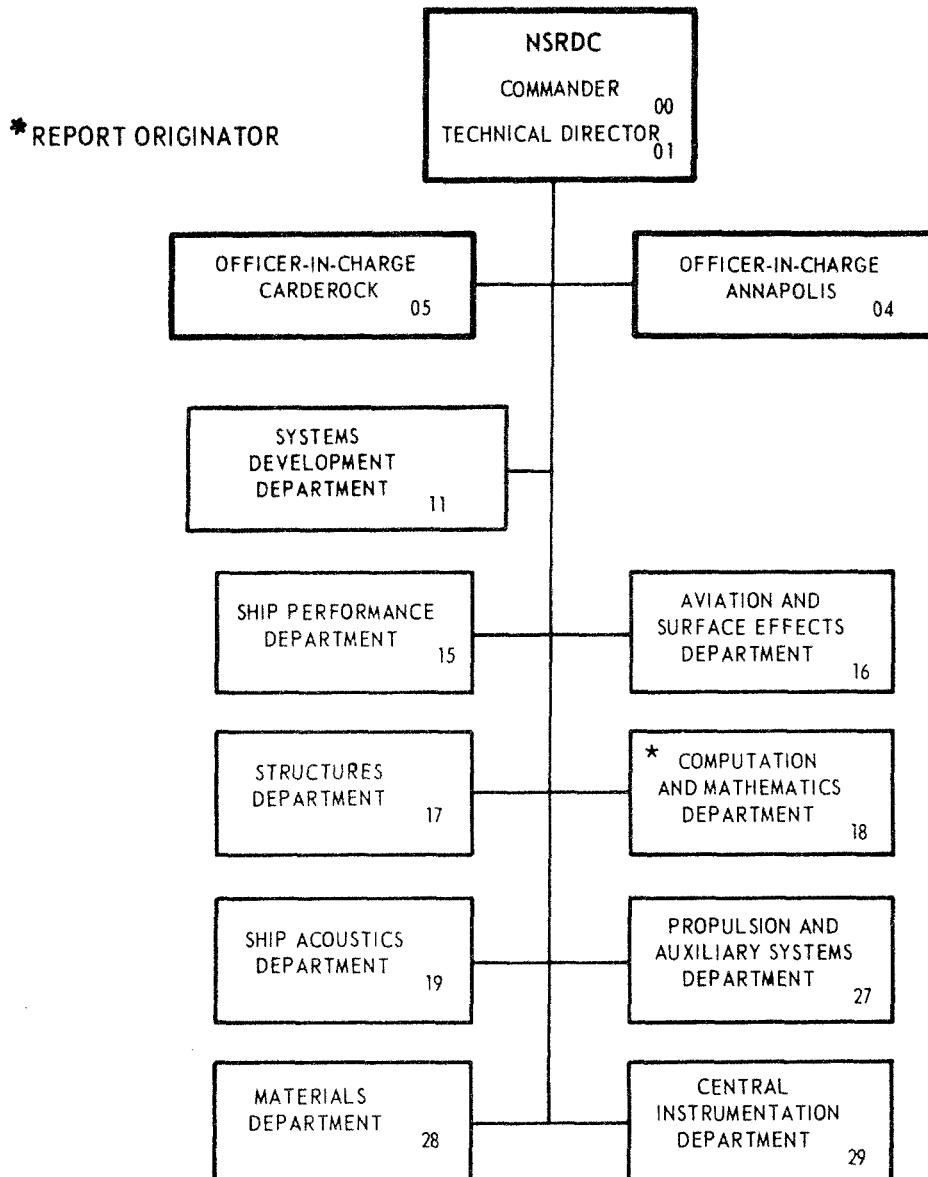
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Naval Ship Research and Development Center

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DEPARTMENT OF THE NAVY  
NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER  
BETHESDA, MD. 20034

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## ABSTRACT

The theory of the converging factors for the Fresnel integrals is developed from that of the converging factors for the sine and cosine integrals, and is then applied to the calculation on a CDC 6700 system of tables of these factors and their reduced derivatives to about 35 decimal places. The factors were used in conjunction with appropriately truncated asymptotic series to produce appended 28-place tables of the Fresnel integrals  $S_2(x)$ ,  $C_2(x)$  and of the closely related rocket functions  $rr(x)$  and  $ri(x)$ , for successive integer values of  $x$  from 1 through 70. An abridged 28-place table of  $S(x)$  and  $C(x)$ , for  $x$  ranging from 1 through 6, is also included.

## ADMINISTRATIVE INFORMATION

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## INTRODUCTION

The Fresnel integrals are encountered in the mathematical analysis of a variety of physical problems, typified by the diffraction of light passing through an aperture and by the reduction of the level of sound by barriers such as solid walls. These integrals also appear in the parametric equations of transition curves used in the design of highways. Moreover, they are closely related to the error function of a complex argument, and thereby to certain functions involved in the mathematical theory of rocket flight.

It was in connection with his study of the diffraction of light that Fresnel<sup>1</sup> published in 1826 the first table of approximate numerical values of these integrals (correct to about three decimal places). Subsequently, a large number of more elaborate tables have appeared. These are listed by A. Fletcher<sup>2</sup> and his associates. Especially noteworthy tabulations include: the five-place table of Wijngaarden and Scheen<sup>3</sup>, published in 1949; a seven-place Russian table<sup>4</sup> published in 1953; the six-place table of Pearcey<sup>5</sup> (1956); and the abridged seven-place table (with auxiliary functions to 15 decimals) in the National Bureau of Standards Handbook of Mathematical Functions<sup>6</sup>, first published in 1964.

In this report methods are developed for the expeditious computation of converging factors for the Fresnel integrals, which, in conjunction with appropriately truncated asymptotic series, permit the numerical evaluation of these integrals to high precision. Specifically, these converging factors and their reduced derivatives are herein tabulated to 33 and 35 decimal places (Tables 1 - 8).

<sup>1</sup> References are listed on page 107.

The corresponding algorithms were programmed for the CDC 6700 system and have been used to calculate 28-place tables of the Fresnel integrals  $S_2(x)$  and  $C_2(x)$  for  $x = 1(1)70$  (Tables 9 and 10). The related rocket functions  $rr(x)$  and  $ri(x)$  were also calculated to 28 decimals for the same values of the argument (Tables 12 and 13).

This computer program was also used to evaluate the Fresnel integrals  $S(x)$  and  $C(x)$ , which are equivalent to  $S_2(\frac{\pi x^2}{2})$  and  $C_2(\frac{\pi x^2}{2})$ . These results, for  $x = 1(1)6$ , are also included in this report (Table 11).

## THE FRESNEL INTEGRALS

The sine and cosine Fresnel integrals have been defined in a variety of equivalent ways in the mathematical literature.<sup>6</sup>

Thus, we find the representations

$$S(z) = \int_0^z \sin\left(\frac{\pi}{2} t^2\right) dt , \quad (1)$$

$$C(z) = \int_0^z \cos\left(\frac{\pi}{2} t^2\right) dt , \quad (2)$$

and

$$S_1(x) = \sqrt{\frac{2}{\pi}} \int_0^x \sin t^2 dt , \quad (3)$$

$$C_1(x) = \sqrt{\frac{2}{\pi}} \int_0^x \cos t^2 dt , \quad (4)$$

and

$$S_2(x) = \frac{1}{\sqrt{2\pi}} \int_0^x \frac{\sin t}{\sqrt{t}} dt = \frac{1}{2} \int_0^x J_{\frac{1}{2}}(t) dt , \quad (5)$$

$$C_2(x) = \frac{1}{\sqrt{2\pi}} \int_0^x \frac{\cos t}{\sqrt{t}} dt = \frac{1}{2} \int_0^x J_{-\frac{1}{2}}(t) dt , \quad (6)$$

where  $J_{\frac{1}{2}}(t)$  and  $J_{-\frac{1}{2}}(t)$  are the ordinary Bessel functions of the first kind of orders  $\frac{1}{2}$  and  $-\frac{1}{2}$ , respectively.

These three pairs of functions are related by the equations

$$S(x) = S_1(x \sqrt{\frac{\pi}{2}}) \pm S_2(\frac{\pi}{2} x^2) \quad (7)$$

$$C(x) = C_1(x \sqrt{\frac{\pi}{2}}) \pm C_2(\frac{\pi}{2} x^2) \quad (8)$$

The Fresnel integrals are related to the probability integral (or error function) of semi-imaginary argument,  $x i^{\frac{1}{2}}$ . To see this, set  $t = v i^{\frac{1}{2}}$  in the integral

$$\text{Erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} dt \quad (9)$$

Then we infer

$$\text{Erf}(x i^{\frac{1}{2}}) = \frac{2 i^{\frac{1}{2}}}{\sqrt{\pi}} \int_0^x e^{-i v^2} dv \quad (10)$$

$$= \frac{2 i^{\frac{1}{2}}}{\sqrt{\pi}} \left\{ \int_0^x \cos v^2 dv - i \int_0^x \sin v^2 dv \right\}, \quad (11)$$

or

$$(2 i)^{-\frac{1}{2}} \text{Erf}(x i^{\frac{1}{2}}) = C_1(x) = i S_i(x) \quad (12)$$

THE ASYMPTOTIC SERIES FOR THE FRESNEL INTEGRALS AND THEIR CONVERGING FACTORS

To derive asymptotic series for the Fresnel integrals we take as starting point the truncated asymptotic series

$$\int_x^{\infty} e^{-iv^2} dv = \frac{e^{-ix^2}}{2ix} \left\{ 1 - \frac{1}{2ix^2} + \frac{1 \cdot 3}{(2ix^2)^2} - \dots + (-1)^n \frac{1 \cdot 3 \cdots (2n-1)}{(2ix^2)^n} c_n(x^2) \right\}, \quad (13)$$

where the converging factor  $c_n(x^2)$  is given by

$$c_n(x^2) = 1 - \frac{2n+1}{2ix^2} + \frac{(2n+1)(2n+3)}{(2ix^2)^2} - \dots \quad (14)$$

$$= 1 - \frac{n + \frac{1}{2}}{ix^2} + \frac{(n + \frac{1}{2})(n + \frac{3}{2})}{(ix^2)^2} - \dots \quad (15)$$

$$= \frac{1}{\Gamma(n + \frac{1}{2})} \left\{ \Gamma(n + \frac{1}{2}) - \frac{\Gamma(n + \frac{3}{2})}{ix^2} + \frac{\Gamma(n + \frac{5}{2})}{(ix^2)^2} - \dots \right\} \quad (16)$$

$$\begin{aligned} &= \frac{1}{\Gamma(n + \frac{1}{2})} \left\{ \int_0^{\infty} t^{n-\frac{1}{2}} e^{-t} dt - \frac{1}{ix^2} \int_0^{\infty} t^{n+\frac{1}{2}} e^{-t} dt \right. \\ &\quad \left. + \frac{1}{(ix^2)^2} \int_0^{\infty} t^{n+\frac{3}{2}} e^{-t} dt - \dots \right\} \quad (17) \end{aligned}$$

$$= \frac{1}{\Gamma(n + \frac{1}{2})} \left\{ \int_0^{\infty} n^{n-\frac{1}{2}} \left( 1 - \frac{t}{ix^2} + \frac{t^2}{(ix^2)^2} - \dots \right) e^{-t} dt \right\} \quad (18)$$

$$= \frac{1}{\Gamma(n + \frac{1}{2})} \int_0^{\infty} \frac{t^{n-\frac{1}{2}} e^{-t}}{1 + \frac{t}{ix^2}} dt \quad (19)$$

$$= \frac{1}{\Gamma(n + \frac{1}{2})} \int_0^\infty \frac{t^{n-\frac{1}{2}} e^{-t}}{1 + \frac{t^2}{4x}} dt + \frac{i x^{-2}}{\Gamma(n + \frac{1}{2})} \int_0^\infty \frac{t^{n+\frac{1}{2}} e^{-t}}{1 + \frac{t^2}{4x}} dt \quad (20)$$

Hence, if we define the converging factor  $\Pi_s(z)$  by the integral

$$\Pi_s(z) = \frac{1}{\Gamma(s+1)} \int_0^\infty \frac{t^s e^{-t}}{1 + (\frac{t}{z})^2} dt, \quad (21)$$

then we have the relation

$$c_n(x^2) = \frac{\Pi_{\frac{n}{2}}(x^2)}{n - \frac{1}{2}} + \frac{(2n+1)i}{2x^2} \frac{\Pi_{\frac{n+1}{2}}(x^2)}{n + \frac{1}{2}} \quad (22)$$

From Equation (13) we then obtain

$$\begin{aligned} \int_x^\infty \cos v^2 dv - i \int_x^\infty \sin v^2 dv &= (\cos x^2 - i \sin x^2) \\ &\cdot \left\{ \frac{1}{2ix} - \frac{1}{(2i)^2 x^3} + \frac{1 \cdot 3}{(2i)^3 x^5} - \dots + (-1)^n \frac{1 \cdot 3 \dots (2n-1)}{(2i)^{n+1} x^{2n+1}} \frac{\Pi_{\frac{n}{2}}(x^2)}{n - \frac{1}{2}} \right. \\ &\quad \left. + (-1)^{n+1} \frac{1 \cdot 3 \dots (2n+1)}{(2i)^{n+2} x^{2n+3}} \frac{\Pi_{\frac{n+1}{2}}(x^2)}{n + \frac{1}{2}} \right\} \end{aligned} \quad (23)$$

Multiplying the factors in the right member of Equation (23) and equating the real and imaginary parts of the resulting form of that equation, we obtain the expansions

$$\int_x^\infty \cos v^2 dv = P(x) \cos x^2 - Q(x) \sin x^2, \quad (24)$$

$$\int_x^\infty \sin v^2 dv = P(x) \sin x^2 + Q(x) \cos x^2, \quad (25)$$

where

$$P(x) = \frac{1}{2^2 x^3} - \frac{1 \cdot 3 \cdot 5}{2^4 x^7} + \dots + (-1)^k \frac{1 \cdot 3 \dots (4k+1)}{2^{2k+2} x^{4k+3}} \frac{\pi}{2k+\frac{1}{2}} (x^2) \quad (26)$$

$$Q(x) = \frac{1}{2x} - \frac{1 \cdot 3}{2^3 x^5} + \dots + (-1)^k \frac{1 \cdot 3 \dots (4k-1)}{2^{2k+1} x^{4k+1}} \frac{\pi}{2k-\frac{1}{2}} (x^2) \quad (27)$$

From standard tables of definite integrals it is known that the Fresnel integrals have a common limiting value of  $\frac{1}{2}$  as the argument (upper limit) of each tends to infinity.

Thus, we conclude that

$$S_1(x) = \frac{1}{2} - (2/\pi)^{\frac{1}{2}} \left\{ P(x) \sin x^2 + Q(x) \cos x^2 \right\}, \quad (28)$$

$$C_1(x) = \frac{1}{2} - (2/\pi)^{\frac{1}{2}} \left\{ P(x) \cos x^2 + Q(x) \sin x^2 \right\}, \quad (29)$$

with similar expansions for the other forms of the Fresnel integrals, by virtue of Equation (7) and Equation (8).

By means of the series in Equation (28) and Equation (29) the Fresnel integrals can be numerically evaluated to high precision for large or even moderately large values of  $x$ , provided the appropriate converging factors can be calculated. The expeditious calculation of these converging factors is the main purpose of this report.

It may be noted here that although the Maclaurin expansions

$$S_1(x) = (2/\pi)^{\frac{1}{2}} \left\{ \frac{x^3}{3} - \frac{x^7}{7 \cdot 3!} + \frac{x^{11}}{11 \cdot 5!} - \dots + (-1)^n \frac{x^{4n-1}}{(4n-1)(2n-1)!} + \dots \right\} \quad (30)$$

$$C_1(x) = (2/\pi)^{\frac{1}{2}} \left\{ \frac{x^5}{5 \cdot 2!} + \frac{x^9}{9 \cdot 4!} - \dots + (-1)^n \frac{x^{4n-3}}{(4n-3)(2n-2)!} + \dots \right\} \quad (31)$$

Although the series in Equations (26) and (27) converge for all values of  $x$ , they are unsatisfactory for calculating the Fresnel integrals when  $x$  exceeds 5, say, because of relatively slow convergence and the loss of figures resulting from partial cancellation of nearly equal terms of the alternating series. For example, when  $x = 5$  a total of 60 terms of the alternating series in Equations (30) and (31) are required to yield accuracy to 30 decimal places, and nine significant figures before the decimal point are lost through cancellation. On the other hand, a total of 25 terms of the series in Equations (26) and (27) in conjunction with Equations (28) and (29) are required to give  $S_1(5)$  and  $C_1(5)$  to 40 decimals when 30-place approximations to the converging factors  $\Pi_{49}(25)$  and  $\Pi_{51}(25)$  are used, and furthermore no figures are lost through cancellation.

## CALCULATION OF THE CONVERGING FACTORS AND THEIR DERIVATIVES

If we write Equation (22) in the form

$$c_n(x^2) = \pi_{n-\frac{1}{2}}(x^2) + i \Omega_{n-\frac{1}{2}}(x^2) \quad (32)$$

then we have the relation

$$\Omega_s(z) = \frac{z}{\Gamma(s+1)} \int_0^\infty \frac{t^{s+1} e^{-t}}{t^2 + z^2} dt \quad (s > -2) \quad (33)$$

$$= \frac{s+1}{z} \pi_{s+1}(z) , \quad (34)$$

where  $\pi_s(z)$  is given by Equation (21).

To derive a similar relation between  $\pi_s(z)$  and  $\Omega_{s+1}(z)$ , we proceed as follows:

$$\begin{aligned} \pi_s(z) &= \frac{z^2}{\Gamma(s+1)} \int_0^\infty \frac{t^s e^{-t}}{t^2 + z^2} dt \quad (s > -1) \\ &= 1 - \frac{1}{\Gamma(s+1)} \int_0^\infty t^s e^{-t} dt + \frac{z^2}{\Gamma(s+1)} \int_0^\infty \frac{t^s e^{-t}}{t^2 + z^2} dt \end{aligned} \quad (35)$$

$$= 1 - \frac{1}{\Gamma(s+1)} \int_0^\infty \frac{t^{s+2} e^{-t}}{t^2 + z^2} dt \quad (36)$$

$$= 1 - \frac{s+1}{z} \Omega_{s+1}(z) , \quad (37)$$

which is the desired relation.

We next derive relations between the converging factors  $\pi_s(z)$  and  $\Omega_s(z)$  and their derivatives.

Differentiating both sides of Equation (21) with respect to  $z$ , we obtain

$$\frac{d}{dz} \Pi_s(z) = \frac{2z}{\Gamma(s+1)} \int_0^\infty \frac{t^{s+2} e^{-t}}{(t^2 + z^2)^2} dt \quad (38)$$

Integration by parts then yields

$$\begin{aligned} 2 \int_0^\infty \frac{t^{s+2} e^{-t}}{(t^2 + z^2)^2} dt &= - \frac{t^{s+1} e^{-t}}{t^2 + z^2} \Big|_0^\infty + \int_0^\infty (s+1)t^s e^{-t} \frac{-t^{s+1} e^{-t}}{t^2 + z^2} dt \\ &= \int_0^\infty \frac{(s+1-t)t^s e^{-t}}{t^2 + z^2} dt \end{aligned}$$

Hence,

$$\begin{aligned} \frac{d}{dz} \Pi_s(z) &= \frac{z}{\Gamma(s+1)} \int_0^\infty \frac{(s+1-t)t^s e^{-t}}{t^2 + z^2} dt \quad (39) \\ &= \frac{(s+1)z}{\Gamma(s+1)} \int_0^\infty \frac{t^s e^{-t}}{t^2 + z^2} dt - \frac{z}{\Gamma(s+1)} \int_0^\infty \frac{t^{s+1} e^{-t}}{t^2 + z^2} dt \end{aligned}$$

By Equations (21) and (33), this implies

$$\frac{d}{dz} \Pi_s(z) = \frac{s+1}{z} \Pi_s(z) - \Omega_s(z) , \quad (40)$$

which is the first of the desired relations

Similarly, if we differentiate both sides of Equation (33) with respect to  $z$ , we find

$$\frac{d}{dz} \Omega_s(z) = \frac{z}{\Gamma(s+1)} \int_0^\infty \frac{(t^2 - z^2)t^{s+1} e^{-t}}{(t^2 + z^2)^2} dt \quad (41)$$

Integration by parts then yields

$$\begin{aligned}
 \int_0^\infty \frac{(t^2 - z^2) t^{s+1} e^{-t}}{(t^2 + z^2)^2} dt &= \frac{1}{2} \int_0^\infty \frac{[(s+2)t^2 - t^3 + z^2 t - sz^2] t^{s-1} e^{-t}}{t^2 + z^2} dt \\
 &= \frac{1}{2} \int_0^\infty \frac{(s+1-t) t^{s+1} e^{-t}}{t^2 + z^2} dt \\
 &\quad + \frac{1}{2} \int_0^\infty \frac{(t^2 + z^2 t - sz^2) t^{s-1} e^{-t}}{t^2 + z^2} dt \\
 &= \int_0^\infty \frac{(s+1-t) t^{s+1} e^{-t}}{t^2 + z^2} dt ,
 \end{aligned}$$

since

$$\begin{aligned}
 \int_0^\infty \frac{(t^2 + z^2 t - sz^2) t^{s-1} e^{-t}}{t^2 + z^2} dt &= \int_0^\infty \frac{(s+1-t) t^{s+1} e^{-t}}{t^2 + z^2} dt \\
 &\quad - \int_0^\infty (s-t) t^{s-1} e^{-t} dt .
 \end{aligned}$$

and

$$\begin{aligned}
 \int_0^\infty (s-t) t^{s-1} e^{-t} dt &= s \int_0^\infty t^{s-1} e^{-t} dt - \int_0^\infty t^s e^{-t} dt \\
 &= s \Gamma(s) - \Gamma(s+1) = 0 .
 \end{aligned}$$

Therefore, we have

$$\begin{aligned}
 \frac{d}{dz} \Omega_s(z) &= \frac{1}{\Gamma(s+1)} \int_0^\infty \frac{(s+1-t) t^{s+1} e^{-t}}{t^2 + z^2} dt \tag{42} \\
 &= \frac{1}{\Gamma(s+1)} \int_0^\infty \frac{[(s+1)t + z^2] t^s e^{-t}}{t^2 + z^2} dt - \frac{1}{\Gamma(s+1)} \int_0^\infty t^s e^{-t} dt \\
 &= \frac{(s+1)}{\Gamma(s+1)} \int_0^\infty \frac{t^{s+1} e^{-t}}{t^2 + z^2} dt + \frac{z^2}{\Gamma(s+1)} \int_0^\infty \frac{t^s e^{-t}}{t^2 + z^2} dt - 1 ,
 \end{aligned}$$

whence

$$\frac{d}{dz} \Omega_s(z) = \frac{s+1}{z} \Omega_s(z) + \Pi_s(z) - 1 , \quad (43)$$

which is the second desired relation between the converging factors and their derivatives.

To obtain similar relations for the second derivatives, we differentiate both sides of Equations (40) and (43) after multiplying by  $z$ , and find

$$z \frac{d^2}{dz^2} \Pi_s(z) = s \frac{d}{dz} \Pi_s(z) - z \frac{d}{dz} \Omega_s(z) - \Omega_s(z) , \quad (44)$$

$$z \frac{d^2}{dz^2} \Omega_s(z) = s \frac{d}{dz} \Omega_s(z) + z \frac{d}{dz} \Pi_s(z) + \Pi_s(z) - 1 . \quad (45)$$

If we let  $d_j$  and  $\delta_j$  represent, respectively, the values of  $\frac{d^j}{dz^j} \Pi_s(z)$  and  $\frac{d^j}{dz^j} \Omega_s(z)$  when  $z = s$ , then Equations (40), (43),

(44), and (45) reduce to

$$d_1 = (1 + \frac{1}{s}) d_0 - \delta_0 \quad (46)$$

$$\delta_1 = (1 + \frac{1}{s}) \delta_0 + d_0 - 1 \quad (47)$$

$$d_2 = d_1 - \delta_1 - \delta_0/s \quad (48)$$

$$\delta_2 = \delta_1 + d_1 + \frac{d_0 - 1}{s} \quad (49)$$

If we proceed in the same manner to find higher derivatives of the converging factors, we find that

$$d_k = (1 - \frac{k-2}{s}) d_{k-1} - \delta_{k-1} - \frac{k-1}{s} \delta_{k-2} , \quad (50)$$

$$\delta_k = \left(1 - \frac{k-2}{s}\right) \delta_{k-1} + d_{k-1} + \frac{k-1}{s} d_{k-2}, \quad (51)$$

when  $k \geq 3$ .

Thus we can systematically evaluate all the  $d_k$  and  $\delta_k$  once we know the values of  $d_0 = \Pi_s(s)$  and  $\delta_0 = \Omega_s(s)$ . Then we can write at once the Taylor series

$$\Pi_s(s+h) = d_0 + d_1 h + \frac{d_2}{2!} h^2 + \frac{d_3}{3!} h^3 + \dots \quad (52)$$

and

$$\Omega_s(s+h) = \delta_0 + \delta_1 h + \frac{\delta_2}{2!} h^2 + \frac{\delta_3}{3!} h^3 + \dots, \quad (53)$$

which permit the evaluation of the converging factors in the neighborhood if a given argument  $s$ .

The calculation of the extensive tables in this report was performed in the following manner. For large values of  $s$  the following asymptotic series were available:

$$2\Pi_s(s) = 1 - \frac{1}{2s} + \frac{1}{(2s)^2} + \frac{3}{(2s)^3} - \frac{55}{(2s)^4} + \frac{599}{(2s)^5} \\ - \frac{5823}{(2s)^6} + \frac{49595}{(2s)^7} - \frac{266743}{(2s)^8} + \frac{2679473}{(2s)^9} + \dots, \quad (54)$$

$$2\Omega_s(s) = 1 - \frac{1}{2s} + \frac{3}{(2s)^2} - \frac{13}{(2s)^3} + \frac{59}{(2s)^4} - \frac{185}{(2s)^5} \\ - \frac{1309}{(2s)^6} + \frac{45387}{(2s)^7} - \frac{832613}{(2s)^8} + \frac{12609823}{(2s)^9} - \dots. \quad (55)$$

Indeed, the first 60 coefficients of each of these series have been tabulated in an earlier report<sup>7</sup> by the present authors.

For the evaluation of the Fresnel integrals by means of Equations (24) - (29) it is clearly necessary to specialize  $s$  to numbers of the form  $n + \frac{1}{2}$ , where  $n$  is an integer.

To attain final accuracy to about 35 decimal places from 60 terms of the series in Equations (54) and (55), it was found necessary to take  $s \geq 70.5$ . From the values of  $\pi_s(s)$ ,  $\Omega_s(s)$ , and their derivatives thus calculated on a CDC 6700 system for  $s = 70.5$ , it was possible to calculate  $\pi_{s-1}(s-1)$  and  $\Omega_{s-1}(s-1)$  by the appropriate Taylor series, and then deduce  $\pi_{s-1}(s-1)$  and  $\Omega_{s-1}(s-1)$  by means of the difference equations (34) and (37).

By such a recurrent procedure the appended table of  $\pi_{s+\frac{1}{2}}(s+\frac{1}{2})$  and its reduced derivatives,  $D_j = d_j/j!$  was calculated to 35 decimal places for  $s = 1(1)70$ , that is, for all integral values of  $s$  from 1 to 70, inclusive. The final two decimals in this table should be considered as guard figures.

In order to check the stability of this backward recurrence, the final value, namely  $\pi_{\frac{3}{2}}(\frac{3}{2})$ , was calculated independently from the following power series given by Dingle<sup>8</sup>:

$$\begin{aligned} \pi_s(z) &= \frac{z^2}{s(s-1)} \left\{ 1 - \frac{z^2}{(s-2)(s-3)} + \frac{z^4}{(s-2)(s-3)(s-4)(s-5)} - \dots \right\} \\ &\quad + \frac{\pi z^{s+1}}{\Gamma(s+1)} \frac{\sin(z + \frac{\pi s}{2})}{\sin \pi s} . \end{aligned} \quad (56)$$

Setting  $z = s = \frac{3}{2}$  and evaluating 21 terms of the series to more than 40 decimal places, we obtain

$$\pi_{\frac{3}{2}}(\frac{3}{2}) = 0.38103 27723 47441 35241 84636 04433 15865 71377 ,$$

which is less than the tabulated values by about  $4.3 \cdot 10^{-34}$ . This serves to confirm that the tabular entries should be considered consistently accurate to 33 decimals.

Only a portion of the companion table of  $\Omega_{s-\frac{1}{2}}(s-\frac{1}{2})$  is reproduced herein; namely, a tabulation of that converging factor to 33 decimal places for  $s = 1(1)70$ . This limitation does not detract from the practical utility of this report, inasmuch as the converging factor  $\Pi_{s-\frac{1}{2}}(s-\frac{1}{2})$  and its reduced derivatives are all that are required to calculate the Fresnel integrals from Equations (26) - (29).

Because of the relation of  $\Pi_s(z)$  and  $\Omega_s(z)$  to certain definite integrals, as shown in Equations (21) and (33), it is considered useful also to reproduce tables of  $\Pi_{s-\frac{1}{2}}(s)$ ,  $\Omega_{s-\frac{1}{2}}(s)$ ,  $\Pi_{s+\frac{1}{2}}(s)$ ,  $\Omega_{s+\frac{1}{2}}(s)$ ,  $\Pi_{s+\frac{1}{2}}(s-\frac{1}{2})$ , and  $\Omega_{s+\frac{1}{2}}(s-\frac{1}{2})$ , all to 33 decimal places, and for  $s = 1(1)70$ , except for the first two, wherein  $s$  ranges up to 71.

As a further partial check on the electronic computer calculations, the value of the converging factor  $\Pi_{\frac{3}{2}}(1)$  was found to about 40 places from Equation (56) by means of a desk calculator. The result was

$$\Pi_{\frac{3}{2}}(1) = 0.25396 60243 36788 20750 56056 53722 93693 02532,$$

which agrees with the earlier approximation to within  $2 \cdot 10^{-34}$ .

For completeness, the following value of  $\Pi_{\frac{1}{2}}(\frac{1}{2})$ , also calculated in two ways, is recorded:

$$\Pi_{\frac{1}{2}}(\frac{1}{2}) = 0.26823 29533 84628 45377 84421 62033 05691 \dots$$

The corresponding reduced derivatives were not calculated because of their excessive number with respect to convenient tabulation.

## APPLICATIONS

The method of converging factors set forth in this report has been programmed and used on the CDC 6700 system in the Computation and Mathematics Department to calculate in double-precision arithmetic a table of the Fresnel integrals  $S_2(x)$  and  $C_2(x)$  to 28 decimal places for  $x = 2(1)70$  (Tables 9 and 10) and a table of  $S(x)$  and  $C(x)$  for  $x = 1(1)6$  (Table 11).

As a partial check, a desk calculator was used to evaluate

$$\int_1^{\infty} \sin v^2 dv = P(1) \sin 1 + Q(1) \cos x ,$$

$$\int_1^{\infty} \cos v^2 dv = P(1) \cos 1 - Q(1) \sin x ,$$

where

$$P(1) = \frac{1}{4} \pi_{\frac{1}{2}}(1) ,$$

$$Q(1) = \frac{1}{2} - \frac{3}{8} \pi_{\frac{3}{2}}(1) .$$

Then

$$S_2(1) = S_1(1) = \frac{1}{2} - \sqrt{\frac{2}{\pi}} \int_1^{\infty} \sin v^2 dv ,$$

$$C_2(1) = C_1(1) = \frac{1}{2} - \sqrt{\frac{2}{\pi}} \int_1^{\infty} \cos v^2 dv .$$

The numerical values thus calculated are:

$$S_2(1) = 0.24755 82876 51610 84260 99050 14405 217 ,$$

$$C_2(1) = 0.72170 59242 92605 08777 15858 15611 907 .$$

As a further check, the same procedure was used to evaluate

$$\int_{\sqrt{2}}^{\infty} \sin v^2 dv = P(\sqrt{2}) \sin 2 + Q(\sqrt{2}) \cos 2 ,$$

$$\int_{\sqrt{2}}^{\infty} \cos v^2 dv = P(\sqrt{2}) \cos 2 - Q(\sqrt{2}) \sin 2 ,$$

where

$$P(\sqrt{2}) = \frac{\sqrt{2}}{16} [1 - \frac{15}{16} \frac{\pi_5}{2}(2)] ,$$

$$Q(\sqrt{2}) = \frac{\sqrt{2}}{4} [1 - \frac{3}{16} \frac{\pi_3}{2}(2)] .$$

Then, since

$$S_2(2) = S_1(\sqrt{2}) = \frac{1}{2} - \sqrt{\frac{2}{\pi}} \int_{\sqrt{2}}^{\infty} \sin v^2 dv$$

and

$$C_2(2) = C_1(\sqrt{2}) = \frac{1}{2} - \sqrt{\frac{2}{\pi}} \int_{\sqrt{2}}^{\infty} \cos v^2 dv ,$$

we deduce the values

$$S_2(2) = 0.56284 89062 30056 47929 80811 09137 254 ,$$

$$C_2(2) = 0.75330 23754 67891 16558 21899 71106 416 .$$

The Fresnel integrals  $S_2(x)$  and  $C_2(x)$  are closely related to the rocket functions introduced by Rosser et al<sup>9</sup> in a study of the exterior ballistics of fin-stabilized rocket projectiles. These functions are defined as the real and imaginary parts of the complex integrals

$$rc(w) = i e^{i w} \int_w^{\infty} \frac{e^{-ix}}{\sqrt{x}} dx$$

$$= rr(w) + i ri(w)$$

Thus, the rocket functions  $rr(w)$  and  $ri(w)$  are given by the equations

$$rr(w) = \cos w \int_w^\infty \frac{\sin x}{\sqrt{x}} dx - \sin w \int_w^\infty \frac{\cos x}{\sqrt{x}} dx \quad (57)$$

$$ri(w) = \cos w \int_w^\infty \frac{\cos x}{\sqrt{x}} dx + \sin w \int_w^\infty \frac{\sin x}{\sqrt{x}} dx \quad (58)$$

If we set  $x = y^2$  in these integrals and use Equations (24) and (25), we deduce the relations

$$rr(w) = 2Q(\sqrt{w}) \quad (59)$$

$$ri(w) = 2P(\sqrt{w})$$

Consequently, the rocket functions are computable as a by-product of the evaluation of the Fresnel integrals by means of the series in Equations (26) and (27).

For convenient reference, tables of the rocket functions thus calculated to 28 decimals for integer arguments from 1 to 70, inclusive, are included in this report as Tables 12 and 13.

As a final illustration of the use of the present tables of converging factors and their reduced derivatives, we evaluate  $S_2(x)$  when  $x = 5.24$  in order to check and extend the calculation of that value as given in the NBS Handbook.<sup>6</sup> We can write

$$S_2(5.24) = S_1(\sqrt{5.24}) \\ = \frac{1}{2} - \left(\frac{2}{\pi}\right)^{\frac{1}{2}} \left\{ P(\sqrt{5.24}) \sin(5.24) + Q(\sqrt{5.24}) \cos(5.24) \right\},$$

where

$$P(\sqrt{5.24}) = \frac{1}{2\sqrt{5.24}} \left\{ \frac{1}{10.48} - \frac{3 \cdot 5}{10.48^3} + \frac{3 \cdot 5 \cdot 7 \cdot 9}{10.48^5} \frac{\pi_9}{2}(5.24) \right\},$$

$$Q(\sqrt{5.24}) = \frac{1}{2\sqrt{5.24}} \left\{ 1 - \frac{3}{10.48^2} + \frac{3 \cdot 5 \cdot 7}{10.48^4} - \frac{3 \cdot 5 \cdot 7 \cdot 9 \cdot 11}{10.48^6} \frac{\pi_{11}}{2}(5.24) \right\}.$$

The converging factors  $\pi_{\frac{9}{2}}(5.24)$  and  $\pi_{\frac{11}{2}}(5.24)$  are then calculated by the Taylor series in Equation (52) from the tabulated values of  $\pi_{\frac{9}{2}}(4.5)$  and  $\pi_{\frac{11}{2}}(5.5)$  and the corresponding reduced derivatives, taking  $h = 0.74$  and  $h = -0.26$ , respectively. Thus we calculate

$$\pi_{\frac{9}{2}}(5.24) = 0.51578 \ 34390 \ 28829 \ 00112 \ 57204 \ 80642 \ 32326 ,$$

$$\pi_{\frac{11}{2}}(5.24) = 0.43799 \ 18752 \ 09521 \ 60878 \ 79477 \ 87444 \ 92751 ,$$

whence

$$S_2(5.24) = 0.42717 \ 67188 \ 77837 \ 56118 \ 94216 \ 34146 \ 91721 .$$

APPENDIX A  
VALUES OF  $\Pi_{S+\frac{1}{2}}(s+\frac{1}{2})$  AND OF ITS REDUCED DERIVATIVES

In this appendix are tabulated to 35 decimal places the values of the converging factor  $\Pi_{S+\frac{1}{2}}(s+\frac{1}{2})$  and its reduced derivatives  $D_i$ , which represents  $\frac{1}{i!} \frac{d^i}{dx^i} \Pi_{S+\frac{1}{2}}(x)$  evaluated at  $x = s+\frac{1}{2}$ . This table (Table 1) has been photographically reproduced from computer output that was left-justified. Accordingly, the position of the decimal point for each tabular entry is determined by the right-hand indentation.

Table 1 - Table of  $\Pi_{s+1/2}(s + 1/2)$  and its Reduced Derivatives  $D_i$  to 35D for  $s = 1$  (1) 70

S = 1.5

D SUB I

I

|    |         |       |       |       |       |       |       |     |         |       |       |   |
|----|---------|-------|-------|-------|-------|-------|-------|-----|---------|-------|-------|---|
| 0  | 38103   | 27723 | 47441 | 35241 | 84636 | 04433 | 15909 | 78  | 24159   | 78224 | 74743 | 1 |
| 1  | 22967   | 93457 | 19473 | 83836 | 71015 | 20252 | 85200 | 79  | - 15380 | 78117 | 27371 | 0 |
| 2  | - 48614 | 52731 | 68446 | 89744 | 40849 | 93040 | 7999  | 80  | 97976   | 87110 | 95350 |   |
| 3  | 30588   | 76947 | 35042 | 34698 | 01746 | 03308 | 820   | 81  | - 62448 | 48254 | 76393 |   |
| 4  | 33162   | 11359 | 54622 | 64195 | 39451 | 47664 | 525   | 82  | 39826   | 02684 | 42217 |   |
| 5  | - 24411 | 28662 | 68701 | 60575 | 71471 | 62814 | 799   | 83  | - 25412 | 80961 | 65420 |   |
| 6  | 12505   | 87515 | 65353 | 68686 | 68785 | 45789 | 940   | 84  | 16224   | 56528 | 55703 |   |
| 7  | - 57817 | 11878 | 75934 | 99785 | 70012 | 30683 | 69    | 85  | - 10363 | 88134 | 78975 |   |
| 8  | 25989   | 12243 | 27041 | 98840 | 30786 | 81159 | 97    | 86  | 66236   | 17847 | 4218  |   |
| 9  | - 11710 | 99057 | 39674 | 37524 | 38355 | 56534 | 08    | 87  | - 42353 | 20373 | 2015  |   |
| 10 | 53618   | 19256 | 04236 | 01695 | 84530 | 36451 | 5     | 88  | 27095   | 07201 | 0647  |   |
| 11 | - 25078 | 27723 | 74956 | 24399 | 09623 | 38396 | 1     | 89  | - 17342 | 13052 | 9730  |   |
| 12 | 11999   | 27369 | 89580 | 62254 | 60146 | 59186 | 7     | 90  | 11104   | 98348 | 2298  |   |
| 13 | - 58699 | 60473 | 35627 | 42718 | 27343 | 28233 |       | 91  | - 71142 | 98715 | 638   |   |
| 14 | 29316   | 17283 | 31390 | 40832 | 27234 | 21911 |       | 92  | 45597   | 44754 | 733   |   |
| 15 | - 14921 | 20206 | 38029 | 69044 | 26517 | 33280 |       | 93  | - 29237 | 41122 | 419   |   |
| 16 | 77258   | 12753 | 32304 | 08586 | 04693 | 9759  |       | 94  | 18755   | 25962 | 443   |   |
| 17 | - 40624 | 85399 | 39994 | 34877 | 10203 | 7147  |       | 95  | - 12036 | 18885 | 118   |   |
| 18 | 21660   | 92447 | 38871 | 60069 | 24612 | 5860  |       | 96  | 77273   | 88600 | 56    |   |
| 19 | - 11695 | 05540 | 50716 | 30622 | 31189 | 3800  |       | 97  | - 49630 | 72063 | 41    |   |
| 20 | 63861   | 61437 | 72768 | 21229 | 69528 | 391   |       | 98  | 31888   | 84716 | 58    |   |
| 21 | - 35231 | 04178 | 06305 | 46523 | 95768 | 092   |       | 99  | - 20497 | 17087 | 49    |   |
| 22 | 19617   | 83183 | 91254 | 44812 | 69736 | 522   |       | 100 | 13179   | 91025 | 91    |   |
| 23 | - 11016 | 85317 | 88912 | 81604 | 70726 | 667   |       | 101 | - 84779 | 54530 | 0     |   |
| 24 | 62348   | 90906 | 24822 | 68522 | 27607 | 40    |       | 102 | 54553   | 99768 | 0     |   |
| 25 | - 35537 | 38113 | 66283 | 95679 | 33150 | 89    |       | 103 | - 35116 | 87110 | 0     |   |
| 26 | 20388   | 23066 | 84506 | 85181 | 24307 | 84    |       | 104 | 22612   | 87261 | 9     |   |
| 27 | - 11767 | 64353 | 09452 | 90397 | 24358 | 64    |       | 105 | - 14566 | 10410 | 3     |   |
| 28 | 68300   | 40120 | 13783 | 03106 | 57736 | 9     |       | 106 | 93859   | 00716 |       |   |
| 29 | - 39847 | 44826 | 39627 | 83741 | 60496 | 6     |       | 107 | - 60499 | 33435 |       |   |
| 30 | 23359   | 57119 | 67208 | 64134 | 37112 | 8     |       | 108 | 39008   | 98289 |       |   |
| 31 | - 13755 | 42735 | 93821 | 62766 | 55401 | 2     |       | 109 | - 25160 | 27710 |       |   |
| 32 | 81339   | 16160 | 57680 | 98751 | 58973 |       |       | 110 | 16233   | 06104 |       |   |
| 33 | - 48286 | 44771 | 12372 | 54598 | 42174 |       |       | 111 | - 10476 | 52248 |       |   |
| 34 | 28770   | 34043 | 01129 | 53475 | 44205 |       |       | 112 | 67633   | 7063  |       |   |
| 35 | - 17201 | 35068 | 30135 | 86286 | 00225 |       |       | 113 | - 43675 | 3292  |       |   |
| 36 | 10317   | 86586 | 64538 | 29316 | 32855 |       |       | 114 | 28211   | 9992  |       |   |
| 37 | - 62079 | 23911 | 63196 | 62815 | 6558  |       |       | 115 | - 18228 | 6283  |       |   |
| 38 | 37459   | 16585 | 37594 | 96369 | 6270  |       |       | 116 | 11781   | 3322  |       |   |
| 39 | - 22665 | 06608 | 84172 | 76527 | 7564  |       |       | 117 | - 76164 | 569   |       |   |
| 40 | 13749   | 29189 | 88323 | 86526 | 5209  |       |       | 118 | 49252   | 434   |       |   |
| 41 | - 83612 | 30617 | 72958 | 99401 | 565   |       |       | 119 | - 31857 | 855   |       |   |
| 42 | 50965   | 11309 | 20196 | 77389 | 371   |       |       | 120 | 20611   | 876   |       |   |
| 43 | - 31134 | 29235 | 21615 | 31514 | 977   |       |       | 121 | - 13339 | 170   |       |   |
| 44 | 19059   | 96322 | 31305 | 33005 | 284   |       |       | 122 | 86347   | 25    |       |   |
| 45 | - 11691 | 74188 | 00679 | 50413 | 472   |       |       | 123 | - 55908 | 11    |       |   |
| 46 | 71857   | 22714 | 46667 | 09736 | 58    |       |       | 124 | 36208   | 12    |       |   |
| 47 | - 44244 | 40982 | 10071 | 63940 | 76    |       |       | 125 | - 23455 | 26    |       |   |
| 48 | 27290   | 29015 | 29828 | 00135 | 32    |       |       | 126 | 15197   | 63    |       |   |
| 49 | - 16861 | 14273 | 05054 | 83782 | 13    |       |       | 127 | - 98494 | 4     |       |   |
| 50 | 10434   | 32399 | 36885 | 52777 | 24    |       |       | 128 | 63847   | 7     |       |   |
| 51 | - 64671 | 26102 | 55424 | 52648 | 7     |       |       | 129 | - 41397 | 6     |       |   |
| 52 | 40142   | 18491 | 42049 | 95681 | 5     |       |       | 130 | 26847   | 3     |       |   |
| 53 | - 24952 | 14665 | 83582 | 81448 | 8     |       |       | 131 | - 17414 | 8     |       |   |
| 54 | 15531   | 30955 | 71261 | 73049 | 2     |       |       | 132 | 11298   | 7     |       |   |
| 55 | - 66800 | 79478 | 30211 | 35899 |       |       |       | 133 | - 73322 |       |       |   |
| 56 | 60408   | 64329 | 51423 | 54447 |       |       |       | 134 | 47591   |       |       |   |
| 57 | - 37744 | 04079 | 81663 | 28997 |       |       |       | 135 | - 30896 |       |       |   |
| 58 | 23610   | 64061 | 62744 | 24166 |       |       |       | 136 | 20061   |       |       |   |
| 59 | - 14786 | 28729 | 79003 | 08108 |       |       |       | 137 | - 13029 |       |       |   |
| 60 | 92701   | 20226 | 56124 | 9389  |       |       |       | 138 | 8463    |       |       |   |
| 61 | - 58179 | 52767 | 98632 | 6215  |       |       |       | 139 | - 5498  |       |       |   |
| 62 | 36550   | 90823 | 88658 | 8206  |       |       |       | 140 | 3573    |       |       |   |
| 63 | - 22985 | 53599 | 70982 | 2571  |       |       |       | 141 | - 2322  |       |       |   |
| 64 | 14468   | 57022 | 04775 | 3608  |       |       |       | 142 | 1509    |       |       |   |
| 65 | - 91158 | 63658 | 34999 | 834   |       |       |       | 143 | - 981   |       |       |   |
| 66 | 57485   | 53656 | 70830 | 532   |       |       |       | 144 | 638     |       |       |   |
| 67 | - 36282 | 38594 | 15805 | 006   |       |       |       | 145 | - 415   |       |       |   |
| 68 | 22919   | 12569 | 17590 | 127   |       |       |       | 146 | 270     |       |       |   |
| 69 | - 14489 | 52697 | 13257 | 504   |       |       |       | 147 | - 175   |       |       |   |
| 70 | 91675   | 60962 | 77087 | 63    |       |       |       | 148 | 114     |       |       |   |
| 71 | - 58047 | 93677 | 19126 | 89    |       |       |       | 149 | - 74    |       |       |   |
| 72 | 36782   | 69367 | 52179 | 45    |       |       |       | 150 | 48      |       |       |   |
| 73 | - 23324 | 63315 | 32916 | 02    |       |       |       | 151 | - 31    |       |       |   |
| 74 | 14801   | 02654 | 45143 | 60    |       |       |       | 152 | 20      |       |       |   |
| 75 | - 93986 | 63853 | 85485 | 9     |       |       |       | 153 | - 13    |       |       |   |
| 76 | 59721   | 34042 | 15897 | 0     |       |       |       | 154 | 8       |       |       |   |
| 77 | - 37972 | 95011 | 56502 | 8     |       |       |       |     |         |       |       |   |

S = 2.5

| I  | D SUB I                                    |
|----|--|
| 0  | 41936 11674 52711 23170 45662 85386 16533  |
| 1  | 15398 90023 57888 40062 78223 35595 30714  |
| 2  | - 22491 05135 57280 06921 02539 24462 2097 |
| 3  | 82887 58073 31137 57420 52594 12907 78     |
| 4  | 72338 71976 01032 39715 72693 05199 11     |
| 5  | - 32081 60341 56448 04056 20782 09620 52   |
| 6  | 96088 26434 62492 00528 75337 15773 0      |
| 7  | - 24853 60552 56852 46925 14666 74001 4    |
| 8  | 59842 88039 33192 62923 31204 07040        |
| 9  | - 13880 47844 65775 38247 35238 23804      |
| 10 | 31574 24266 31235 13026 59186 1169         |
| 11 | - 71080 02735 44344 53516 86485 205        |
| 12 | 15885 91399 35215 54536 30980 610          |
| 13 | - 35178 70852 39926 65692 37128 92         |
| 14 | 76594 93420 17573 59149 51050 9            |
| 15 | - 16125 75740 16098 12133 17785 7          |
| 16 | 31668 97636 81926 32173 16416              |
| 17 | - 52750 42009 63613 03284 5032             |
| 18 | 46783 06970 31325 83697 052                |
| 19 | 16731 28172 95156 43323 161                |
| 20 | - 13906 06201 87123 27847 381              |
| 21 | 68506 89105 49864 55886 30                 |
| 22 | - 28938 07828 47601 19087 79               |
| 23 | 11391 06976 14490 70266 14                 |
| 24 | - 43154 80845 57097 58531 0                |
| 25 | 15983 65620 66375 70261 7                  |
| 26 | - 58381 64184 63789 88687                  |
| 27 | 21139 19096 61082 42783                    |
| 28 | - 76128 94133 45245 7973                   |
| 29 | 27328 12961 44949 6765                     |
| 30 | - 97929 70584 57778 196                    |
| 31 | 35068 07230 32692 161                      |
| 32 | - 12557 92934 48769 895                    |
| 33 | 44994 27761 76360 90                       |
| 34 | - 16135 76544 58625 56                     |
| 35 | 57933 34630 32929 2                        |
| 36 | - 20828 33253 57721 0                      |
| 37 | 74998 33019 74058                          |
| 38 | - 27043 94415 56390                        |
| 39 | 97683 22935 5135                           |
| 40 | - 35341 55154 8150                         |
| 41 | 12807 72922 5051                           |
| 42 | - 46492 08874 885                          |
| 43 | 16904 46665 219                            |
| 44 | - 61564 62154 20                           |
| 45 | 22457 30803 52                             |
| 46 | - 82048 10799 5                            |
| 47 | 30022 73366 7                              |
| 48 | - 11002 41989 6                            |
| 49 | 40380 10859                                |
| 50 | - 14841 32568                              |
| 51 | 54624 6058                                 |
| 52 | - 20132 5576                               |
| 53 | 74300 053                                  |
| 54 | - 27456 405                                |
| 55 | 10158 923                                  |
| 56 | - 37634 52                                 |
| 57 | 13958 72                                   |
| 58 | - 51833 6                                  |
| 59 | 19269 5                                    |
| 60 | - 71714                                    |
| 61 | 26718                                      |
| 62 | - 9964                                     |
| 63 | 3720                                       |
| 64 | - 1390                                     |
| 65 | 520  |
| 66 | - 194                                      |
| 67 | 72   |
| 68 | - 27                                       |
| 69 | 10   |
| 70 | - 3  |
| 71 | 1  |

S = 3.5

I

D SUB I

|    |       |       |       |       |       |       |       |      |
|----|-------|-------|-------|-------|-------|-------|-------|------|
| 0  | 43894 | 31929 | 07890 | 69179 | 18511 | 13098 | 73086 |      |
| 1  | 11652 | 21877 | 61406 | 80671 | 53825 | 76766 | 59592 |      |
| 2  | -     | 13079 | 56012 | 68424 | 97337 | 30367 | 41430 | 7225 |
| 3  | 32487 | 00151 | 03295 | 23671 | 36057 | 93655 | 20    |      |
| 4  | 25257 | 09606 | 72633 | 36878 | 44374 | 87799 | 41    |      |
| 5  | -     | 79817 | 17047 | 71895 | 82256 | 03337 | 13306 | 0    |
| 6  | 16667 | 33890 | 89098 | 75364 | 98003 | 33273 | 6     |      |
| 7  | -     | 28864 | 42781 | 67650 | 38169 | 03495 | 53383 |      |
| 8  | 43969 | 00456 | 34239 | 58863 | 77005 | 8308  |       |      |
| 9  | -     | 59215 | 10631 | 19603 | 47661 | 73357 | 715   |      |
| 10 | 66768 | 25892 | 33004 | 68493 | 10636 | 66    |       |      |
| 11 | -     | 47240 | 42427 | 54915 | 27017 | 78990 | 2     |      |
| 12 | -     | 44628 | 11543 | 60063 | 52201 | 43405 |       |      |
| 13 | 31145 | 82927 | 57432 | 86754 | 09799 |       |       |      |
| 14 | -     | 98249 | 42647 | 29492 | 96629 | 0636  |       |      |
| 15 | 25663 | 34402 | 73941 | 54913 | 4207  |       |       |      |
| 16 | -     | 61890 | 87040 | 91270 | 45885 | 737   |       |      |
| 17 | 14346 | 81729 | 17119 | 07127 | 017   |       |       |      |
| 18 | -     | 32589 | 23173 | 66465 | 13747 | 28    |       |      |
| 19 | 73309 | 53941 | 05434 | 10322 | 1     |       |       |      |
| 20 | -     | 16432 | 75051 | 16189 | 33136 | 6     |       |      |
| 21 | 36844 | 82766 | 48930 | 42118 |       |       |       |      |
| 22 | -     | 82830 | 75484 | 93600 | 3583  |       |       |      |
| 23 | 18698 | 19816 | 84906 | 6876  |       |       |       |      |
| 24 | -     | 42422 | 32921 | 53885 | 065   |       |       |      |
| 25 | 96784 | 11350 | 78431 | 69    |       |       |       |      |
| 26 | -     | 22209 | 87913 | 40814 | 00    |       |       |      |
| 27 | 51270 | 12909 | 15221 | 2     |       |       |       |      |
| 28 | -     | 11905 | 63352 | 87789 | 1     |       |       |      |
| 29 | 27808 | 09313 | 04185 |       |       |       |       |      |
| 30 | -     | 65322 | 02862 | 8633  |       |       |       |      |
| 31 | 15429 | 20168 | 9572  |       |       |       |       |      |
| 32 | -     | 36638 | 70842 | 582   |       |       |       |      |
| 33 | 87450 | 67894 | 43    |       |       |       |       |      |
| 34 | -     | 20976 | 08839 | 01    |       |       |       |      |
| 35 | 50551 | 77947 | 6     |       |       |       |       |      |
| 36 | -     | 12238 | 07119 | 4     |       |       |       |      |
| 37 | 29755 | 72207 |       |       |       |       |       |      |
| 38 | -     | 72648 | 7889  |       |       |       |       |      |
| 39 | 17807 | 7595  |       |       |       |       |       |      |
| 40 | -     | 43816 | 662   |       |       |       |       |      |
| 41 | 10820 | 516   |       |       |       |       |       |      |
| 42 | -     | 26814 | 41    |       |       |       |       |      |
| 43 | 66670 | 9     |       |       |       |       |       |      |
| 44 | -     | 16630 | 0     |       |       |       |       |      |
| 45 | 41608 |       |       |       |       |       |       |      |
| 46 | -     | 10441 |       |       |       |       |       |      |
| 47 | 2627  |       |       |       |       |       |       |      |
| 48 | -     | 662   |       |       |       |       |       |      |
| 49 | 167   |       |       |       |       |       |       |      |
| 50 | -     | 42    |       |       |       |       |       |      |
| 51 | 10    |       |       |       |       |       |       |      |
| 52 | -     | 2     |       |       |       |       |       |      |

S = 4.5

I

O SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 45086   | 58915 | 06093 | 77010 | 31417 | 69925 | 68262 |
| 1  | 93955   | 92374 | 27802 | 84361 | 60596 | 25584 | 5354  |
| 2  | - 85844 | 86396 | 87968 | 02438 | 62814 | 05419 | 200   |
| 3  | 15511   | 94228 | 21310 | 06622 | 68956 | 14394 | 19    |
| 4  | 11206   | 21010 | 41835 | 22913 | 54218 | 45923 | 45    |
| 5  | - 27428 | 19836 | 76937 | 88333 | 90775 | 98890 | 0     |
| 6  | 43580   | 53953 | 35722 | 39852 | 37822 | 10695 |       |
| 7  | - 55263 | 81066 | 85023 | 59533 | 47601 | 0952  |       |
| 8  | 57353   | 35587 | 37589 | 16594 | 39197 | 036   |       |
| 9  | - 43779 | 48838 | 47853 | 01943 | 72571 | 72    |       |
| 10 | 68994   | 84533 | 86429 | 29421 | 26604 |       |       |
| 11 | 63607   | 20262 | 86860 | 60091 | 73429 |       |       |
| 12 | - 18246 | 40461 | 30850 | 69238 | 71007 |       |       |
| 13 | 37141   | 61270 | 11729 | 09950 | 1326  |       |       |
| 14 | - 66321 | 54813 | 70064 | 68446 | 254   |       |       |
| 15 | 11077   | 52948 | 02002 | 96560 | 090   |       |       |
| 16 | - 17815 | 96649 | 55151 | 27417 | 40    |       |       |
| 17 | 28029   | 62137 | 45019 | 71580 | 3     |       |       |
| 18 | - 43553 | 69750 | 98828 | 12075 |       |       |       |
| 19 | 67252   | 34667 | 33480 | 8617  |       |       |       |
| 20 | - 10361 | 86092 | 78246 | 0940  |       |       |       |
| 21 | 15973   | 54399 | 97534 | 021   |       |       |       |
| 22 | - 24681 | 97229 | 09904 | 21    |       |       |       |
| 23 | 38270   | 85378 | 35954 | 7     |       |       |       |
| 24 | - 59586 | 85475 | 63877 |       |       |       |       |
| 25 | 93186   | 50522 | 6315  |       |       |       |       |
| 26 | - 14637 | 93884 | 7620  |       |       |       |       |
| 27 | 23090   | 69599 | 675   |       |       |       |       |
| 28 | - 36563 | 50339 | 18    |       |       |       |       |
| 29 | 58084   | 56210 | 6     |       |       |       |       |
| 30 | - 92501 | 90062 |       |       |       |       |       |
| 31 | 14754   | 10568 |       |       |       |       |       |
| 32 | - 23542 | 3358  |       |       |       |       |       |
| 33 | 37526   | 946   |       |       |       |       |       |
| 34 | - 59650 | 83    |       |       |       |       |       |
| 35 | 94333   | 0     |       |       |       |       |       |
| 36 | - 14795 | 7     |       |       |       |       |       |
| 37 | 22916   |       |       |       |       |       |       |
| 38 | - 3482  |       |       |       |       |       |       |
| 39 | 514     |       |       |       |       |       |       |
| 40 | - 72    |       |       |       |       |       |       |
| 41 | 9       |       |       |       |       |       |       |
| 42 | - 1     |       |       |       |       |       |       |

S = 5.5

I C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 45889   | 48235 | €3063 | 59858 | 51194 | 78075 | 16545 |
| 1  | 78811   | 18671 | 53206 | 69345 | 53973 | 92499 | 8066  |
| 2  | - 60775 | 40683 | 24952 | 77688 | 98304 | 32337 | 938   |
| 3  | 83945   | 97753 | 13684 | 77803 | €8114 | 35016 | 5     |
| 4  | 57811   | 12344 | 50173 | 13656 | 18947 | 04432 | 7     |
| 5  | - 11483 | 70438 | 92333 | 01757 | 97445 | 59431 | 7     |
| 6  | 14636   | 82382 | 95230 | 88581 | 21140 | 17122 |       |
| 7  | - 14350 | 08502 | 79691 | 53191 | 39243 | 9146  |       |
| 8  | 10513   | 98360 | €4104 | 52834 | 17243 | 834   |       |
| 9  | - 35555 | 16558 | 37194 | 51269 | 23514 | 6     |       |
| 10 | - 58147 | 69323 | 87888 | 55754 | 82213 |       |       |
| 11 | 16807   | 33400 | 70046 | 88054 | 73887 |       |       |
| 12 | - 28682 | 84715 | 21538 | 52269 | 7230  |       |       |
| 13 | 40809   | 49518 | 92264 | 27215 | 489   |       |       |
| 14 | - 52664 | 42669 | 41571 | 83800 | 50    |       |       |
| 15 | 63796   | 33554 | 71490 | 72749 | 3     |       |       |
| 16 | - 73761 | 24753 | 05895 | 59217 |       |       |       |
| 17 | 82036   | 51563 | 65925 | 2208  |       |       |       |
| 18 | - 87910 | 57924 | 39464 | 170   |       |       |       |
| 19 | 90338   | 46663 | 48593 | 73    |       |       |       |
| 20 | - 87744 | 62772 | 35212 | 0     |       |       |       |
| 21 | 77744   | 12894 | €6954 |       |       |       |       |
| 22 | - 56738 | 57178 | 9818  |       |       |       |       |
| 23 | 19321   | 55675 | 821   |       |       |       |       |
| 24 | 42603   | 88017 | 65    |       |       |       |       |
| 25 | - 14114 | 26194 | 79    |       |       |       |       |
| 26 | 29438   | 13542 | 7     |       |       |       |       |
| 27 | - 52935 | 54177 |       |       |       |       |       |
| 28 | 88652   | 0533  |       |       |       |       |       |
| 29 | - 14265 | 1110  |       |       |       |       |       |
| 30 | 22403   | 816   |       |       |       |       |       |
| 31 | - 34651 | 67    |       |       |       |       |       |
| 32 | 53075   | 9     |       |       |       |       |       |
| 33 | - 80802 |       |       |       |       |       |       |
| 34 | 12257   |       |       |       |       |       |       |
| 35 | - 1855  |       |       |       |       |       |       |
| 36 | 280     |       |       |       |       |       |       |
| 37 | - 42    |       |       |       |       |       |       |
| 38 | 6       |       |       |       |       |       |       |

S = 6.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 46467   | 10459 | 60702 | 60960 | 77533 | 27010 | 60107 |
| 1  | 67918   | 77247 | 32650 | 66518 | 59664 | 51761 | 1473  |
| 2  | - 45331 | 42670 | 90097 | 79036 | 50707 | 20062 | 161   |
| 3  | 49573   | 94896 | 04724 | 11004 | 97246 | 91546 | 0     |
| 4  | 32748   | 82104 | 36866 | 55415 | 75156 | 20947 | 8     |
| 5  | - 54984 | 00245 | 77671 | 94570 | 25729 | 55173 |       |
| 6  | 58253   | 54303 | 48565 | 57790 | 85767 | 4721  |       |
| 7  | - 45813 | 35648 | 11586 | 08852 | 77999 | 636   |       |
| 8  | 24007   | 73117 | 37046 | 94984 | 71649 | 28    |       |
| 9  | 66581   | 79499 | 81970 | 37489 | 4722  |       |       |
| 10 | - 23190 | 99816 | 53656 | 36930 | 32464 |       |       |
| 11 | 40536   | 30743 | 21604 | 24556 | 9814  |       |       |
| 12 | - 51456 | 27624 | 10084 | 54838 | 176   |       |       |
| 13 | 55991   | 63966 | 34534 | 32638 | 61    |       |       |
| 14 | - 54936 | 21593 | 17437 | 37186 | 1     |       |       |
| 15 | 49403   | 89434 | 12930 | 37800 |       |       |       |
| 16 | - 40534 | 55914 | 42897 | 6133  |       |       |       |
| 17 | 29326   | 32219 | 13755 | 560   |       |       |       |
| 18 | - 16561 | 63534 | 47724 | 38    |       |       |       |
| 19 | 27932   | 95008 | 35381 |       |       |       |       |
| 20 | 11637   | 15470 | 62676 |       |       |       |       |
| 21 | - 26567 | 68649 | 1140  |       |       |       |       |
| 22 | 41982   | 36339 | 622   |       |       |       |       |
| 23 | - 57982 | 40414 | 57    |       |       |       |       |
| 24 | 74764   | 39671 | 6     |       |       |       |       |
| 25 | - 92606 | 30744 |       |       |       |       |       |
| 26 | 11186   | 09680 |       |       |       |       |       |
| 27 | - 13295 | 6408  |       |       |       |       |       |
| 28 | 15640   | 246   |       |       |       |       |       |
| 29 | - 18280 | 33    |       |       |       |       |       |
| 30 | 21287   | 5     |       |       |       |       |       |
| 31 | - 24747 |       |       |       |       |       |       |
| 32 | 2876    |       |       |       |       |       |       |
| 33 | - 334   |       |       |       |       |       |       |
| 34 | 38      |       |       |       |       |       |       |
| 35 | - 4     |       |       |       |       |       |       |

S = 7.5

I D SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 46902   | 61333 | 89080 | 60727 | 89616 | 84008 | 33441 |
| 1  | 59696   | 99041 | 70206 | 23871 | 74138 | 03188 | 8353  |
| 2  | - 35130 | 13298 | 96812 | 13650 | 97464 | 16430 | 368   |
| 3  | 31233   | 05734 | 36702 | 78694 | 45826 | 56018 | 7     |
| 4  | 20031   | 22373 | 37575 | 32590 | 01539 | 42945 | 8     |
| 5  | - 29021 | 58556 | 42354 | 06937 | 46220 | 59776 |       |
| 6  | 26222   | 80317 | 54525 | 66562 | 96259 | 5002  |       |
| 7  | - 16992 | 24012 | 05768 | 26633 | 49380 | 856   |       |
| 8  | 63360   | 93704 | 44442 | 08220 | 95565 | 6     |       |
| 9  | 25264   | 73432 | 59913 | 28915 | 84692 |       |       |
| 10 | - 82478 | 60640 | 83003 | 45898 | 9508  |       |       |
| 11 | 10815   | 13372 | 07546 | 40121 | 7053  |       |       |
| 12 | - 10910 | 79984 | 37128 | 26765 | 460   |       |       |
| 13 | 94200   | 53818 | 64832 | 70252 | 9     |       |       |
| 14 | - 71423 | 75358 | 35513 | 68887 |       |       |       |
| 15 | 46714   | 68367 | 43569 | 0097  |       |       |       |
| 16 | - 23814 | 06628 | 66197 | 732   |       |       |       |
| 17 | 46454   | 42232 | 39364 | 7     |       |       |       |
| 18 | 10150   | 81446 | 82724 | 3     |       |       |       |
| 19 | - 20722 | 14899 | 44040 |       |       |       |       |
| 20 | 27623   | 16047 | 6652  |       |       |       |       |
| 21 | - 31558 | 97016 | 084   |       |       |       |       |
| 22 | 33232   | 04786 | 42    |       |       |       |       |
| 23 | - 33263 | 71500 | 7     |       |       |       |       |
| 24 | 32163   | 90973 |       |       |       |       |       |
| 25 | - 30328 | 9329  |       |       |       |       |       |
| 26 | 28053   | 295   |       |       |       |       |       |
| 27 | - 25547 | 02    |       |       |       |       |       |
| 28 | 22953   | 6     |       |       |       |       |       |
| 29 | - 20366 |       |       |       |       |       |       |
| 30 | 1784    |       |       |       |       |       |       |
| 31 | - 154   |       |       |       |       |       |       |
| 32 | 13      |       |       |       |       |       |       |
| 33 | - 1     |       |       |       |       |       |       |

S = 8.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 47242   | 69817 | 76795 | 71806 | 92806 | 70488 | 03952 |
| 1  | 53265   | 34520 | 87660 | 09084 | 10059 | 36688 | 6269  |
| 2  | - 28033 | 74494 | 07026 | 32582 | 70268 | 14132 | 506   |
| 3  | 20688   | 03706 | 33617 | 56173 | 93051 | 33203 | 9     |
| 4  | 12957   | 61827 | 50562 | 88766 | 91317 | 84389 | 3     |
| 5  | - 16498 | 02087 | 65635 | 05575 | 44500 | 00560 |       |
| 6  | 12962   | 98105 | 22579 | 16070 | 83809 | 6463  |       |
| 7  | - 70643 | 14452 | 72329 | 09423 | 29992 | 90    |       |
| 8  | 18272   | 53879 | 27694 | 98060 | 48232 | 1     |       |
| 9  | 15461   | 63232 | 18969 | 02198 | 52612 |       |       |
| 10 | - 30565 | 39744 | 85393 | 22045 | 6069  |       |       |
| 11 | 32330   | 64259 | 37894 | 70577 | 765   |       |       |
| 12 | - 26814 | 66148 | 63848 | 54172 | 34    |       |       |
| 13 | 18723   | 68082 | 86641 | 79872 | 2     |       |       |
| 14 | - 10922 | 38175 | 52661 | 68405 |       |       |       |
| 15 | 47364   | 93303 | 00445 | 813   |       |       |       |
| 16 | - 48386 | 73834 | 53079 | 0     |       |       |       |
| 17 | - 20487 | 30278 | 33310 | 1     |       |       |       |
| 18 | 32754   | 18839 | 87454 |       |       |       |       |
| 19 | - 36229 | 14810 | 8473  |       |       |       |       |
| 20 | 34452   | 20122 | 954   |       |       |       |       |
| 21 | - 30603 | 23969 | 68    |       |       |       |       |
| 22 | 24579   | 37394 | 9     |       |       |       |       |
| 23 | - 19188 | 21306 |       |       |       |       |       |
| 24 | 14353   | 4050  |       |       |       |       |       |
| 25 | - 10287 | 579   |       |       |       |       |       |
| 26 | 70206   | 3     |       |       |       |       |       |
| 27 | - 44868 |       |       |       |       |       |       |
| 28 | 2579    |       |       |       |       |       |       |
| 29 | - 118   |       |       |       |       |       |       |
| 30 | 1       |       |       |       |       |       |       |

S = 9.5

I C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 47515   | 60994 | 08877 | 68463 | 22570 | 58637 | 82620 |
| 1  | 48093   | 60203 | 12686 | 86965 | 12084 | 29958 | 9565  |
| 2  | - 22895 | 47756 | 42708 | 25920 | 47618 | 25429 | 443   |
| 3  | 14262   | 20723 | 93289 | 98264 | 06693 | 23376 | 5     |
| 4  | 87610   | 04389 | 19971 | 02680 | 19615 | 55133 |       |
| 5  | - 99435 | 01784 | 85844 | 14875 | 77456 | 3991  |       |
| 6  | 68984   | 29309 | 91922 | 89757 | 29419 | 966   |       |
| 7  | - 32133 | 00718 | 03550 | 07347 | 69084 | 28    |       |
| 8  | 54470   | 67983 | 37886 | 91438 | 35015 |       |       |
| 9  | 81928   | 11231 | 84507 | 61926 | 5636  |       |       |
| 10 | - 12092 | 02826 | 52497 | 21362 | 5332  |       |       |
| 11 | 10713   | 78232 | 02262 | 54107 | 262   |       |       |
| 12 | - 74624 | 97565 | 72116 | 50430 | 3     |       |       |
| 13 | 42548   | 21440 | 74009 | 41221 |       |       |       |
| 14 | - 18566 | 84242 | 28675 | 2990  |       |       |       |
| 15 | 36941   | 08542 | 24488 | 45    |       |       |       |
| 16 | 39148   | 97973 | €3778 | 5     |       |       |       |
| 17 | - 67388 | 58272 | 22938 |       |       |       |       |
| 18 | 68862   | 76408 | 5001  |       |       |       |       |
| 19 | - 58154 | 39803 | 419   |       |       |       |       |
| 20 | 43919   | 84780 | 15    |       |       |       |       |
| 21 | - 30537 | 92493 | 4     |       |       |       |       |
| 22 | 19733   | 94176 |       |       |       |       |       |
| 23 | - 11799 | 3552  |       |       |       |       |       |
| 24 | €3754   | 57    |       |       |       |       |       |
| 25 | - 28968 | 0     |       |       |       |       |       |
| 26 | 8093    |       |       |       |       |       |       |
| 27 | 343     |       |       |       |       |       |       |
| 28 | - 90    |       |       |       |       |       |       |
| 29 | 11      |       |       |       |       |       |       |
| 30 | - 1     |       |       |       |       |       |       |

S = 10.5

I

O SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 47739   | 44910 | 59762 | 68163 | 38870 | 05951 | 50018 |
| 1  | 43842   | 88144 | 31704 | 49508 | 62408 | 06277 | 9301  |
| 2  | - 19054 | 18869 | 17939 | 94497 | 71356 | 19078 | 925   |
| 3  | 10159   | 26389 | 19042 | 96065 | 06752 | 81334 | 0     |
| 4  | 61400   | 45805 | 46975 | 38412 | 20722 | 99201 |       |
| 5  | - 62835 | 00628 | 80443 | 25134 | 78014 | 8680  |       |
| 6  | 38966   | 19282 | 82155 | 71759 | 98144 | 475   |       |
| 7  | - 15720 | 23298 | 23347 | 29500 | 00533 | 70    |       |
| 8  | 15429   | 30441 | 82568 | 96671 | 58824 |       |       |
| 9  | 42766   | 07821 | 82379 | 77477 | 9338  |       |       |
| 10 | - 51084 | 10025 | 57477 | 10561 | 098   |       |       |
| 11 | 38829   | 11138 | 40750 | 94410 | 55    |       |       |
| 12 | - 23052 | 22791 | 89323 | 43243 | 5     |       |       |
| 13 | 10759   | 71740 | 49208 | 58570 |       |       |       |
| 14 | - 32734 | 21726 | 72303 | 572   |       |       |       |
| 15 | - 39699 | 38850 | 20826 | 1     |       |       |       |
| 16 | 17011   | 16712 | 59134 | 6     |       |       |       |
| 17 | - 18052 | 62875 | 02838 |       |       |       |       |
| 18 | 14417   | 19394 | 7608  |       |       |       |       |
| 19 | - 99072 | 57434 | 16    |       |       |       |       |
| 20 | 60973   | 20024 | 2     |       |       |       |       |
| 21 | - 33857 | 02903 |       |       |       |       |       |
| 22 | 16628   | 9074  |       |       |       |       |       |
| 23 | - 66841 | 43    |       |       |       |       |       |
| 24 | 14960   | 2     |       |       |       |       |       |
| 25 | 8625    |       |       |       |       |       |       |
| 26 | - 1681  |       |       |       |       |       |       |
| 27 | 174     |       |       |       |       |       |       |
| 28 | - 15    |       |       |       |       |       |       |
| 29 | 1       |       |       |       |       |       |       |

S = 11.5

I C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 47926   | 34991 | 27184 | 42689 | 91060 | 27565 | 77584 |
| 1  | 40286   | 24801 | 45986 | 14379 | 94389 | 46925 | 2037  |
| 2  | - 16106 | 50030 | 56866 | 11054 | 70867 | 95160 | 272   |
| 3  | 74369   | 27378 | 34768 | 45141 | 23861 | 94542 |       |
| 4  | 44330   | 86425 | 03566 | 44466 | 2E795 | 36307 |       |
| 5  | - 41290 | 99916 | 12438 | 95464 | 60E75 | 3484  |       |
| 6  | 23121   | 30448 | 21446 | 14076 | 3E564 | 567   |       |
| 7  | - 81681 | 63937 | 54659 | 48453 | 91079 | 6     |       |
| 8  | 32526   | 21485 | 01285 | 60411 | 0175  |       |       |
| 9  | 22722   | 95275 | 85891 | 98233 | 7878  |       |       |
| 10 | - 22924 | 14156 | 24606 | 63812 | 512   |       |       |
| 11 | 15203   | 09738 | 40477 | 96343 | 21    |       |       |
| 12 | - 77770 | 60280 | 28197 | 56722 |       |       |       |
| 13 | 29599   | 42531 | 49560 | 7352  |       |       |       |
| 14 | - 52222 | 97262 | 57565 | 31    |       |       |       |
| 15 | - 41008 | 33180 | 4E983 | 8     |       |       |       |
| 16 | 59104   | 47734 | 25946 |       |       |       |       |
| 17 | - 48506 | 11698 | 2963  |       |       |       |       |
| 18 | 32021   | 31134 | 454   |       |       |       |       |
| 19 | - 18306 | 33015 | 69    |       |       |       |       |
| 20 | 91902   | 09419 |       |       |       |       |       |
| 21 | - 39368 | 0E3C  |       |       |       |       |       |
| 22 | 12618   | 842   |       |       |       |       |       |
| 23 | - 81050 |       |       |       |       |       |       |
| 24 | - 33095 |       |       |       |       |       |       |
| 25 | 3958    |       |       |       |       |       |       |
| 26 | - 332   |       |       |       |       |       |       |
| 27 | 24      |       |       |       |       |       |       |
| 28 | - 1     |       |       |       |       |       |       |

S = 12.5

| I  | D SUB I |       |       |       |       |       |       |  |
|----|---------|-------|-------|-------|-------|-------|-------|--|
| 0  | 48084   | 75169 | 39036 | 32322 | 26323 | 07039 | 14934 |  |
| 1  | 37265   | 89481 | 89835 | 98332 | 22875 | 33823 | 5739  |  |
| 2  | - 13794 | 76675 | 62822 | 82791 | 65976 | 99595 | 183   |  |
| 3  | 55715   | 60625 | 89843 | 94465 | 19309 | 10423 |       |  |
| 4  | 32819   | 12701 | 16245 | 66635 | 01259 | 35459 |       |  |
| 5  | - 28041 | 34033 | 37977 | 46658 | 84335 | 3059  |       |  |
| 6  | 14299   | 11296 | 41237 | 64388 | 88683 | 861   |       |  |
| 7  | - 44648 | 11481 | 29736 | 66388 | 74403 | 0     |       |  |
| 8  | - 38731 | 16274 | 88861 | 22260 | 468   |       |       |  |
| 9  | 12409   | 51954 | 28834 | 25221 | 1571  |       |       |  |
| 10 | - 10858 | 96807 | 09024 | 89357 | 102   |       |       |  |
| 11 | 63644   | 06940 | 69033 | 84833 | 2     |       |       |  |
| 12 | - 28282 | 76590 | 23174 | 27131 |       |       |       |  |
| 13 | 86786   | 53290 | 50228 | 775   |       |       |       |  |
| 14 | - 36473 | 86695 | 93255 | 3     |       |       |       |  |
| 15 | - 20194 | 95460 | 38163 | 1     |       |       |       |  |
| 16 | 20090   | 07856 | 91966 |       |       |       |       |  |
| 17 | - 13650 | 83519 | 4992  |       |       |       |       |  |
| 18 | 76328   | 68787 | 33    |       |       |       |       |  |
| 19 | - 36543 | 87291 | 2     |       |       |       |       |  |
| 20 | 14685   | 85758 |       |       |       |       |       |  |
| 21 | - 43512 | 481   |       |       |       |       |       |  |
| 22 | 23311   | 2     |       |       |       |       |       |  |
| 23 | 98500   |       |       |       |       |       |       |  |
| 24 | - 10591 |       |       |       |       |       |       |  |
| 25 | 796     |       |       |       |       |       |       |  |
| 26 | - 51    |       |       |       |       |       |       |  |
| 27 | 3       |       |       |       |       |       |       |  |

S = 13.5

I

C SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48220   | 70575 | 85944 | 92382 | 66929 | 31624 | 18354 |
| 1  | 34668   | 62688 | 43058 | 83814 | 42100 | 82248 | 7344  |
| 2  | - 11948 | 07575 | 51119 | 47438 | 08500 | 55145 | 335   |
| 3  | 42579   | 13456 | 06036 | 26810 | 72551 | 56414 |       |
| 4  | 24822   | 93057 | 37845 | 70074 | 57475 | 22773 |       |
| 5  | - 19585 | 40891 | 39989 | 12547 | 57094 | 4106  |       |
| 6  | 91606   | 66567 | 16193 | 74116 | 33933 | 69    |       |
| 7  | - 25484 | 44733 | 08452 | 12904 | 43133 | 2     |       |
| 8  | - 12635 | 31661 | 01984 | 16796 | 7217  |       |       |
| 9  | 69813   | 37425 | 42592 | 25616 | 715   |       |       |
| 10 | - 53972 | 73146 | 11871 | 37986 | 11    |       |       |
| 11 | 28241   | 50944 | 59857 | 05270 | 8     |       |       |
| 12 | - 10970 | 80366 | 50805 | 26101 |       |       |       |
| 13 | 26569   | 31037 | 14010 | 548   |       |       |       |
| 14 | 30339   | 55719 | 62188 | 5     |       |       |       |
| 15 | - 88580 | 73002 | 52983 |       |       |       |       |
| 16 | 70016   | 00342 | 4830  |       |       |       |       |
| 17 | - 40651 | 26204 | 518   |       |       |       |       |
| 18 | 19489   | 05233 | 89    |       |       |       |       |
| 19 | - 77860 | 93326 |       |       |       |       |       |
| 20 | 23822   | 4600  |       |       |       |       |       |
| 21 | - 30590 | 79    |       |       |       |       |       |
| 22 | - 29024 | 8     |       |       |       |       |       |
| 23 | 34066   |       |       |       |       |       |       |
| 24 | - 2457  |       |       |       |       |       |       |
| 25 | 146     |       |       |       |       |       |       |
| 26 | - ?     |       |       |       |       |       |       |

S = 14.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48338   | EE416 | 01180 | 7E585 | 70E31 | 22682 | 56731 |
| 1  | 32411   | 07551 | 91487 | 91417 | E7E04 | 61886 | 7918  |
| 2  | - 10449 | 382E4 | E6790 | 76030 | 20481 | 35140 | 326   |
| 3  | 33107   | 11177 | 42626 | 17740 | 74144 | 74828 |       |
| 4  | 19126   | 17549 | 17237 | 98273 | 74E70 | 08415 |       |
| 5  | - 14014 | 98058 | 79684 | 51675 | E8326 | 3628  |       |
| 6  | E0501   | 35047 | 34833 | 46792 | E2334 | 19    |       |
| 7  | - 15100 | 3E380 | 43632 | 21362 | 18617 | 3     |       |
| 8  | - 12761 | 64371 | 21261 | 38928 | 2381  |       |       |
| 9  | 4043E   | 99324 | 38136 | 51902 | 220   |       |       |
| 10 | - 27998 | 75088 | 50887 | 58E70 | 99    |       |       |
| 11 | 13189   | 037E7 | 76254 | 88023 | E     |       |       |
| 12 | - 44998 | 89349 | E9955 | 8888  |       |       |       |
| 13 | 82878   | 10783 | 54322 | 70    |       |       |       |
| 14 | 26495   | 62094 | 27389 | 0     |       |       |       |
| 15 | - 38173 | 57052 | 31625 |       |       |       |       |
| 16 | 25373   | 27361 | 5413  |       |       |       |       |
| 17 | - 12814 | 32735 | E56   |       |       |       |       |
| 18 | 52975   | 512E1 | 7     |       |       |       |       |
| 19 | - 17409 | 898E3 |       |       |       |       |       |
| 20 | 35668   | 434   |       |       |       |       |       |
| 21 | E1166   | 1     |       |       |       |       |       |
| 22 | - 12584 | E     |       |       |       |       |       |
| 23 | 9441    |       |       |       |       |       |       |
| 24 | - 546   |       |       |       |       |       |       |
| 25 | 27      |       |       |       |       |       |       |
| 26 | - 1     |       |       |       |       |       |       |

S = 15.5

I

D SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48441   | 97518 | 51353 | 88966 | 23874 | 13962 | 56125 |
| 1  | 30430   | 50700 | 03855 | 29141 | 25727 | 50422 | 1015  |
| 2  | - 92163 | 24634 | 11049 | 89729 | 41640 | 00217 | 28    |
| 3  | 26135   | 43585 | 70101 | 63737 | 01104 | 41592 |       |
| 4  | 14977   | 41986 | 87156 | 77351 | 22878 | 64545 |       |
| 5  | - 10243 | 19567 | 08766 | 09271 | 09622 | 7020  |       |
| 6  | 41032   | 56815 | 90189 | 12822 | 31425 | 43    |       |
| 7  | - 92444 | 12797 | 57485 | 86175 | 88936 |       |       |
| 8  | - 10599 | 81048 | 99247 | 56630 | 2636  |       |       |
| 9  | 24076   | 09883 | 30194 | 79705 | 748   |       |       |
| 10 | - 15089 | 38596 | 84145 | 43263 | 98    |       |       |
| 11 | 64438   | 09541 | 41417 | 09717 |       |       |       |
| 12 | - 19377 | 12166 | 98927 | 5838  |       |       |       |
| 13 | 25388   | 19715 | 31373 | 34    |       |       |       |
| 14 | 16213   | 16138 | 00720 | 3     |       |       |       |
| 15 | - 16660 | 45784 | 65772 |       |       |       |       |
| 16 | 95957   | 77218 | 379   |       |       |       |       |
| 17 | - 42630 | 56564 | 12    |       |       |       |       |
| 18 | 15214   | 43409 | 7     |       |       |       |       |
| 19 | - 39914 | 5442  |       |       |       |       |       |
| 20 | 33480   | 96    |       |       |       |       |       |
| 21 | 46439   | 8     |       |       |       |       |       |
| 22 | - 42638 |       |       |       |       |       |       |
| 23 | 2528    |       |       |       |       |       |       |
| 24 | - 123   |       |       |       |       |       |       |
| 25 | 5       |       |       |       |       |       |       |

S = 16.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48533   | 20537 | 73463 | 79E24 | E5494 | 25330 | 62195 |
| 1  | 28E78   | 75E89 | 04454 | 44E1E | 51173 | 37614 | 8165  |
| 2  | - 81895 | 6739E | 73422 | 03288 | E7E2E | 25886 | 17    |
| 3  | 20910   | 44035 | 1EE02 | 39883 | 21900 | 40295 |       |
| 4  | 11897   | 25883 | 49116 | 27131 | E4978 | 01552 |       |
| 5  | - 76271 | 44E40 | 91728 | 22843 | 11913 | 421   |       |
| 6  | 28485   | 98244 | 58483 | 36247 | 17763 | 06    |       |
| 7  | - 58245 | 63107 | 97774 | 65370 | 07942 |       |       |
| 8  | - 82084 | 09221 | 55265 | 90451 | E07   |       |       |
| 9  | 14707   | 00089 | 79260 | 28112 | 211   |       |       |
| 10 | - 84147 | 154E0 | E8E05 | 12331 | C     |       |       |
| 11 | 32771   | 98E22 | 78179 | 89061 |       |       |       |
| 12 | - 87071 | 144E8 | 17490 | 068   |       |       |       |
| 13 | 70763   | 65428 | 10028 | 0     |       |       |       |
| 14 | 90559   | 3E2E5 | 33083 |       |       |       |       |
| 15 | - 74466 | 97040 | 4028  |       |       |       |       |
| 16 | 37858   | 34053 | 009   |       |       |       |       |
| 17 | - 14906 | 32997 | 10    |       |       |       |       |
| 18 | 45792   | 37790 |       |       |       |       |       |
| 19 | - 90337 | 064   |       |       |       |       |       |
| 20 | - 81172 | E     |       |       |       |       |       |
| 21 | 20476   | E     |       |       |       |       |       |
| 22 | - 13744 |       |       |       |       |       |       |
| 23 | 686     |       |       |       |       |       |       |
| 24 | - 28    |       |       |       |       |       |       |
| 25 | 1       |       |       |       |       |       |       |

S = 17.5

I

D SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48614   | 35504 | 44326 | 48943 | 38345 | 68960 | 08404 |
| 1  | 27118   | 24311 | 06668 | 16928 | 12804 | 80939 | 8446  |
| 2  | - 73254 | 81342 | 18782 | 84311 | 02255 | 60034 | 47    |
| 3  | 16931   | 21257 | 39821 | 62095 | 67061 | 84741 |       |
| 4  | 95711   | 92165 | 85882 | 80689 | 59158 | 1540  |       |
| 5  | - 57737 | 77300 | 83019 | 16421 | 66611 | 128   |       |
| 6  | 20189   | 37381 | 67895 | 42741 | 40880 | 54    |       |
| 7  | - 37647 | 75981 | 93754 | 74445 | 74003 |       |       |
| 8  | - 61741 | 58623 | 70635 | 73437 | 895   |       |       |
| 9  | 91989   | 90890 | 81194 | 22340 | 95    |       |       |
| 10 | - 48389 | 14868 | 20666 | 55988 | 1     |       |       |
| 11 | 17276   | 49736 | 21197 | 07792 |       |       |       |
| 12 | - 40617 | 81552 | 06424 | 300   |       |       |       |
| 13 | 13698   | 78284 | 18333 | 7     |       |       |       |
| 14 | 49264   | 38980 | 97862 |       |       |       |       |
| 15 | - 34224 | 83961 | 4566  |       |       |       |       |
| 16 | 15552   | 53080 | 274   |       |       |       |       |
| 17 | - 54546 | 4E247 | 7     |       |       |       |       |
| 18 | 14318   | 57064 |       |       |       |       |       |
| 19 | - 18584 | 651   |       |       |       |       |       |
| 20 | - 78957 | 1     |       |       |       |       |       |
| 21 | 80814   |       |       |       |       |       |       |
| 22 | - 4439  |       |       |       |       |       |       |
| 23 | 191     |       |       |       |       |       |       |
| 24 | - 6     |       |       |       |       |       |       |

S = 18.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48687   | 00620 | €4300 | 26073 | €3943 | 2€999 | 22367 |
| 1  | 25719   | 202€2 | 06596 | 24176 | 94445 | 30843 | 5504  |
| 2  | - 65914 | 00451 | 49561 | 16623 | 39923 | 05422 | 64    |
| 3  | 13857   | 02209 | €0570 | 73333 | 93€77 | 43050 |       |
| 4  | 77877   | 710€1 | 22831 | 24€55 | 88027 | 0267  |       |
| 5  | - 44357 | 24563 | 20099 | 99935 | 94€24 | 433   |       |
| 6  | 14576   | 04176 | 95721 | 78855 | 55€39 | 55    |       |
| 7  | - 24896 | 10707 | 68033 | 05769 | €7439 |       |       |
| 8  | - 45911 | 01604 | 65784 | 72195 | 917   |       |       |
| 9  | 58805   | 86831 | 89685 | 88079 | 88    |       |       |
| 10 | - 28€09 | 23769 | 22762 | 72754 | 8     |       |       |
| 11 | 94066   | 72790 | 77110 | 6277  |       |       |       |
| 12 | - 19582 | 89790 | 87316 | 459   |       |       |       |
| 13 | - 24816 | 99785 | 79688 |       |       |       |       |
| 14 | 26740   | 90492 | 93316 |       |       |       |       |
| 15 | - 16189 | 77820 | 3696  |       |       |       |       |
| 16 | 66363   | 95141 | 84    |       |       |       |       |
| 17 | - 20800 | 71948 | 9     |       |       |       |       |
| 18 | 46059   | 1092  |       |       |       |       |       |
| 19 | - 25369 | 36    |       |       |       |       |       |
| 20 | - 43099 | 1     |       |       |       |       |       |
| 21 | 31093   |       |       |       |       |       |       |
| 22 | - 14€3  |       |       |       |       |       |       |
| 23 | 55      |       |       |       |       |       |       |
| 24 | - 1     |       |       |       |       |       |       |

S = 19.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48752   | 42646 | 66812 | 68106 | 46799 | 16048 | 30796 |
| 1  | 24457   | 75520 | 28879 | 27905 | 52701 | 27555 | 3921  |
| 2  | - 59624 | 72146 | 53928 | 72272 | 63173 | 93303 | 39    |
| 3  | 11451   | 26562 | 82975 | 45034 | 77786 | 36026 |       |
| 4  | 64616   | 98278 | 24746 | 39113 | 42194 | 8285  |       |
| 5  | - 34532 | 45255 | 16498 | 67436 | 23626 | 905   |       |
| 6  | 10699   | 53785 | 13079 | 22810 | 25701 | 99    |       |
| 7  | - 16805 | 21251 | 53354 | 28758 | 38640 |       |       |
| 8  | - 34045 | 51543 | 38601 | 76019 | 719   |       |       |
| 9  | 38354   | 16138 | 16927 | 76211 | 39    |       |       |
| 10 | - 17345 | 82050 | 95013 | 91620 | 3     |       |       |
| 11 | 52735   | 22137 | 40364 | 2411  |       |       |       |
| 12 | - 97196 | 27705 | 46684 | 18    |       |       |       |
| 13 | - 57269 | 02544 | 30098 |       |       |       |       |
| 14 | 14638   | 02271 | 06335 |       |       |       |       |
| 15 | - 78790 | 99956 | 847   |       |       |       |       |
| 16 | 29337   | 93771 | 96    |       |       |       |       |
| 17 | - 82333 | 12044 |       |       |       |       |       |
| 18 | 15058   | 8381  |       |       |       |       |       |
| 19 | 52052   | 1     |       |       |       |       |       |
| 20 | - 20689 | 1     |       |       |       |       |       |
| 21 | 12012   |       |       |       |       |       |       |
| 22 | - 496   |       |       |       |       |       |       |
| 23 | 16      |       |       |       |       |       |       |

S = 20.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48811   | 64340 | 01821 | 47949 | 4E525 | 04359 | 16097 |
| 1  | 23314   | 51E22 | 98374 | 65026 | 41433 | 78876 | 8438  |
| 2  | - 54195 | 15538 | 90412 | 89991 | 8E497 | 23602 | 29    |
| 3  | 95465   | 79200 | 78472 | 4224E | 7EE39 | 3126  |       |
| 4  | 53111   | E7531 | 80497 | 41442 | 4173E | 14E7  |       |
| 5  | - 27207 | 86755 | 05287 | 25322 | 30838 | 826   |       |
| 6  | 79726   | 27375 | 27951 | 78838 | 85774 | 4     |       |
| 7  | - 11556 | 457E3 | 73498 | 68347 | 80312 |       |       |
| 8  | - 25294 | 02556 | 92443 | 88992 | 140   |       |       |
| 9  | 25481   | 74472 | 53653 | 22963 | 9E    |       |       |
| 10 | - 10760 | 64922 | 74848 | 02324 | 5     |       |       |
| 11 | 30359   | 15306 | 71987 | 7599  |       |       |       |
| 12 | - 49488 | 78595 | 77903 | 64    |       |       |       |
| 13 | - 52468 | 0E458 | 48200 |       |       |       |       |
| 14 | 81210   | 33329 | 3652  |       |       |       |       |
| 15 | - 39407 | 93323 | 030   |       |       |       |       |
| 16 | 13402   | 71854 | 15    |       |       |       |       |
| 17 | - 33700 | 09378 |       |       |       |       |       |
| 18 | 49199   | 359   |       |       |       |       |       |
| 19 | 75646   | 9     |       |       |       |       |       |
| 20 | - 95464 |       |       |       |       |       |       |
| 21 | 4717    |       |       |       |       |       |       |
| 22 | - 173   |       |       |       |       |       |       |
| 23 | 5       |       |       |       |       |       |       |

S = 21.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48865   | 49878 | 05683 | 56857 | 82456 | 79828 | 24780 |
| 1  | 22273   | 58480 | 34417 | 96307 | 02138 | 54754 | 9473  |
| 2  | - 49475 | 35079 | 52924 | 32017 | 12251 | 07898 | 77    |
| 3  | 80225   | 85522 | 66153 | 48715 | 85902 | 5148  |       |
| 4  | 44435   | 84044 | 12780 | 64381 | 42203 | 1334  |       |
| 5  | - 21671 | 47053 | 74806 | 45347 | 19001 | 640   |       |
| 6  | 60221   | 01540 | 24300 | 23408 | 81535 | 2     |       |
| 7  | - 80823 | 74211 | 86321 | 41677 | 0958  |       |       |
| 8  | - 18875 | 48673 | 63865 | 51938 | 037   |       |       |
| 9  | 17220   | 64917 | 28078 | 87309 | 81    |       |       |
| 10 | - 68168 | 49035 | 99421 | 99187 |       |       |       |
| 11 | 17905   | 80633 | 08362 | 6505  |       |       |       |
| 12 | - 25766 | 25033 | 11682 | 66    |       |       |       |
| 13 | - 39950 | 38886 | 86945 |       |       |       |       |
| 14 | 45767   | 04967 | 6621  |       |       |       |       |
| 15 | - 20229 | 09951 | 847   |       |       |       |       |
| 16 | 63122   | 46042 | 2     |       |       |       |       |
| 17 | - 14214 | 09958 |       |       |       |       |       |
| 18 | 15614   | 669   |       |       |       |       |       |
| 19 | 52487   | 9     |       |       |       |       |       |
| 20 | - 43701 |       |       |       |       |       |       |
| 21 | 1893    |       |       |       |       |       |       |
| 22 | - 62    |       |       |       |       |       |       |
| 23 | 1       |       |       |       |       |       |       |

S = 22.5

I D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48914   | 68874 | 45833 | 82518 | 25565 | 84814 | 31540 |
| 1  | 21321   | 79375 | 07072 | 69874 | 29197 | 57864 | 0970  |
| 2  | - 45346 | 69876 | 73344 | 15354 | 31707 | 40702 | 22    |
| 3  | 67913   | 84088 | 66382 | 21163 | 39076 | 5424  |       |
| 4  | 37463   | 55227 | 46406 | 06605 | 94164 | 7060  |       |
| 5  | - 17433 | 90614 | 01489 | 91161 | 22036 | 808   |       |
| 6  | 46055   | 72000 | 79628 | 60575 | 86310 | 4     |       |
| 7  | - 57404 | 86516 | 06043 | 32399 | 8719  |       |       |
| 8  | - 14168 | 09321 | 19095 | 05536 | 483   |       |       |
| 9  | 11822   | 61124 | 95562 | 05734 | 01    |       |       |
| 10 | - 44023 | 03311 | 51047 | 38054 |       |       |       |
| 11 | 10797   | 69656 | 08716 | 5309  |       |       |       |
| 12 | - 13676 | 43004 | 09638 | 90    |       |       |       |
| 13 | - 28344 | 48295 | 18837 |       |       |       |       |
| 14 | 26223   | 88307 | 9320  |       |       |       |       |
| 15 | - 10642 | 15492 | €82   |       |       |       |       |
| 16 | 30580   | 1841€ | 8     |       |       |       |       |
| 17 | - 61572 | 0317  |       |       |       |       |       |
| 18 | 45342   | 61    |       |       |       |       |       |
| 19 | 31018   | 6     |       |       |       |       |       |
| 20 | - 20125 |       |       |       |       |       |       |
| 21 | 778     |       |       |       |       |       |       |
| 22 | - 23    |       |       |       |       |       |       |

S = 23.5

I

O SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 48959   | 79397 | 18303 | 71791 | 36705 | 71551 | 70628 |
| 1  | 20448   | 14560 | 35133 | 12570 | 11460 | 26110 | 7035  |
| 2  | - 41714 | 38533 | 25392 | 99221 | 66571 | 38715 | 05    |
| 3  | 57878   | 99444 | 44110 | 20419 | 97200 | 4252  |       |
| 4  | 31808   | 26105 | 43134 | 97811 | 57513 | 9789  |       |
| 5  | - 14153 | 09803 | 97092 | 37298 | 40198 | 327   |       |
| 6  | 35624   | 83050 | 92351 | 21019 | 54189 | 9     |       |
| 7  | - 41351 | 98192 | 21888 | 65722 | 7957  |       |       |
| 8  | - 10704 | 88480 | 58518 | 17937 | 836   |       |       |
| 9  | 82359   | 96894 | 70915 | 53298 | 2     |       |       |
| 10 | - 28937 | 72448 | 91649 | 37008 |       |       |       |
| 11 | 66454   | 64109 | 77534 | 607   |       |       |       |
| 12 | - 73791 | 30846 | 35812 | 0     |       |       |       |
| 13 | - 19491 | 42337 | 93340 |       |       |       |       |
| 14 | 15279   | 54126 | 5734  |       |       |       |       |
| 15 | - 57295 | 19129 | 16    |       |       |       |       |
| 16 | 15208   | 17887 | 0     |       |       |       |       |
| 17 | - 27302 | 9642  |       |       |       |       |       |
| 18 | 99498   | 2     |       |       |       |       |       |
| 19 | 17296   | 0     |       |       |       |       |       |
| 20 | - 9386  |       |       |       |       |       |       |
| 21 | 327     |       |       |       |       |       |       |
| 22 | - 8     |       |       |       |       |       |       |

S = 24.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49001   | 30266 | 00556 | 38854 | 40515 | 53481 | 74715 |
| 1  | 19643   | 38283 | 85008 | 82223 | 12087 | 46526 | 4150  |
| 2  | - 38501 | 88134 | 96959 | 13737 | 63010 | 11440 | 06    |
| 3  | 49633   | 43615 | 04192 | 46922 | 21656 | 0071  |       |
| 4  | 27182   | 09131 | 11281 | 54414 | 59972 | 4420  |       |
| 5  | - 11586 | 19279 | 19505 | 35589 | 34817 | 062   |       |
| 6  | 27845   | 56123 | 29588 | 57771 | 62515 | 9     |       |
| 7  | - 30178 | 07343 | 21216 | 26289 | 3249  |       |       |
| 8  | - 81444 | 72651 | 04667 | 02261 | 06    |       |       |
| 9  | 58157   | 13014 | 78270 | 72692 | 1     |       |       |
| 10 | - 19335 | 20228 | 67061 | 55141 |       |       |       |
| 11 | 41676   | 42070 | 39508 | 741   |       |       |       |
| 12 | - 40353 | 30686 | 16044 | 8     |       |       |       |
| 13 | - 13223 | 21860 | 27913 |       |       |       |       |
| 14 | 90507   | 04003 | 431   |       |       |       |       |
| 15 | - 31523 | 90117 | 82    |       |       |       |       |
| 16 | 77497   | 31194 |       |       |       |       |       |
| 17 | - 12353 | 4283  |       |       |       |       |       |
| 18 | - 34804 |       |       |       |       |       |       |
| 19 | 94347   |       |       |       |       |       |       |
| 20 | - 4448  |       |       |       |       |       |       |
| 21 | 141     |       |       |       |       |       |       |
| 22 | - 3     |       |       |       |       |       |       |

S = 25.5

| I  | D SUB I |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49039   | 62822 | 53716 | 24199 | 99901 | 58603 | 79571 |
| 1  | 18899   | 65647 | 87680 | 59664 | 48129 | 75956 | 7127  |
| 2  | - 35646 | 86634 | 52260 | 73159 | 55055 | 85609 | 04    |
| 3  | 42807   | 14019 | 46528 | 26307 | 60659 | 1751  |       |
| 4  | 23368   | 04922 | 39101 | 51094 | 11660 | 5924  |       |
| 5  | - 95583 | 16162 | 62617 | 14871 | 66455 | 70    |       |
| 6  | 21975   | 56129 | 70367 | 80067 | 75932 | 5     |       |
| 7  | - 22289 | 52234 | 14353 | 79813 | 2323  |       |       |
| 8  | - 62402 | 60947 | 48590 | 74924 | 62    |       |       |
| 9  | 41587   | 54880 | 73283 | 20910 | 4     |       |       |
| 10 | - 13116 | 22671 | 65995 | 90209 |       |       |       |
| 11 | 26596   | 04055 | 37812 | 616   |       |       |       |
| 12 | - 22297 | 89981 | 75245 | 5     |       |       |       |
| 13 | - 89313 | 19030 | 0240  |       |       |       |       |
| 14 | 54476   | 08174 | 820   |       |       |       |       |
| 15 | - 17702 | 10159 | 26    |       |       |       |       |
| 16 | 40395   | 24074 |       |       |       |       |       |
| 17 | - 56840 | 389   |       |       |       |       |       |
| 18 | - 25860 | 2     |       |       |       |       |       |
| 19 | 51173   |       |       |       |       |       |       |
| 20 | - 2145  |       |       |       |       |       |       |
| 21 | 62      |       |       |       |       |       |       |
| 22 | - 1     |       |       |       |       |       |       |

S = 26.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49075   | 12308 | 81152 | 89377 | 51874 | 30444 | 08899 |
| 1  | 18210   | 26773 | 41049 | 40172 | 21870 | 49739 | 5447  |
| 2  | - 33098 | 17493 | 30900 | 56882 | 85931 | 93576 | 07    |
| 3  | 37116   | 45720 | 25049 | 39612 | 69937 | 0576  |       |
| 4  | 20200   | 74221 | 59941 | 10829 | 70835 | 0114  |       |
| 5  | - 79418 | 90775 | 77190 | 86129 | 39455 | 82    |       |
| 6  | 17498   | 12121 | 53727 | 47326 | 56574 | 7     |       |
| 7  | - 16647 | 11338 | 27624 | 30481 | 1960  |       |       |
| 8  | - 48148 | 77302 | 83060 | 53322 | 98    |       |       |
| 9  | 30090   | 27651 | 43899 | 94296 | 6     |       |       |
| 10 | - 90235 | 23829 | 61566 | 6725  |       |       |       |
| 11 | 17248   | 89528 | 61669 | 773   |       |       |       |
| 12 | - 12407 | 65716 | 84986 | 2     |       |       |       |
| 13 | - 60365 | 94759 | 1594  |       |       |       |       |
| 14 | 33298   | 36567 | 586   |       |       |       |       |
| 15 | - 10133 | 02467 | 95    |       |       |       |       |
| 16 | 21504   | 73642 |       |       |       |       |       |
| 17 | - 26499 | 512   |       |       |       |       |       |
| 18 | - 24761 | 1     |       |       |       |       |       |
| 19 | 27829   |       |       |       |       |       |       |
| 20 | - 1053  |       |       |       |       |       |       |
| 21 | 28      |       |       |       |       |       |       |

S = 27.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49108   | 08951 | 82032 | 33897 | 20984 | 91470 | 05151 |
| 1  | 17569   | 46454 | 88624 | 02805 | 91292 | 97152 | 2258  |
| 2  | - 30813 | 48266 | 86829 | 05135 | 38998 | 67147 | 67    |
| 3  | 32341   | 79641 | 79207 | 73181 | 79855 | 8296  |       |
| 4  | 17552   | 80781 | 10218 | 59731 | 19359 | 6347  |       |
| 5  | - 66427 | 16535 | 68126 | 42969 | 80603 | 09    |       |
| 6  | 14048   | 52950 | 58985 | 12463 | 78085 | 3     |       |
| 7  | - 12562 | 10069 | 43902 | 08210 | 9704  |       |       |
| 8  | - 37407 | 14422 | 81101 | 29878 | 15    |       |       |
| 9  | 22011   | 79220 | 26715 | 20920 | 8     |       |       |
| 10 | - 62896 | 94708 | 73128 | 1041  |       |       |       |
| 11 | 11356   | 28139 | 38176 | 113   |       |       |       |
| 12 | - 69251 | 69446 | 77650 |       |       |       |       |
| 13 | - 40950 | 39466 | 6258  |       |       |       |       |
| 14 | 20656   | 27959 | 273   |       |       |       |       |
| 15 | - 59059 | 03429 | 9     |       |       |       |       |
| 16 | 11675   | 69837 |       |       |       |       |       |
| 17 | - 12465 | 788   |       |       |       |       |       |
| 18 | - 18614 | 8     |       |       |       |       |       |
| 19 | 15243   |       |       |       |       |       |       |
| 20 | - 526   |       |       |       |       |       |       |
| 21 | 13      |       |       |       |       |       |       |

S = 28.5

I

D SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49138   | 78824 | €4778 | 19977 | 18700 | 09700 | 82608 |
| 1  | 16972   | 27989 | 79891 | 29705 | 52760 | 73690 | 7818  |
| 2  | - 28757 | 53347 | 07021 | 48944 | 09263 | 26075 | 26    |
| 3  | 28311   | 59676 | 82033 | 56370 | 26433 | 8732  |       |
| 4  | 15325   | 23217 | €7976 | 50498 | 47611 | 7849  |       |
| 5  | - 55904 | 584€5 | 05413 | 88€99 | €9418 | 41    |       |
| 6  | 11366   | 01154 | €5910 | 85072 | 52804 | 3     |       |
| 7  | - 95711 | 16881 | 39347 | 59298 | 39€   |       |       |
| 8  | - 29257 | 07405 | 38504 | 79461 | 98    |       |       |
| 9  | 16268   | 43772 | 43561 | 40€14 | 2     |       |       |
| 10 | - 44380 | 25895 | 28294 | 0052  |       |       |       |
| 11 | 75823   | 42704 | €6532 | 73    |       |       |       |
| 12 | - 38575 | 58185 | 03064 |       |       |       |       |
| 13 | - 27930 | 7€582 | €445  |       |       |       |       |
| 14 | 12995   | 8470€ | 562   |       |       |       |       |
| 15 | - 35011 | 15587 | 4     |       |       |       |       |
| 16 | 64567   | 3853  |       |       |       |       |       |
| 17 | - 58868 | 91    |       |       |       |       |       |
| 18 | - 12793 | 2     |       |       |       |       |       |
| 19 | 8431    |       |       |       |       |       |       |
| 20 | - 268   |       |       |       |       |       |       |
| 21 | 6       |       |       |       |       |       |       |

S = 29.5

T

D SUB I

|    |       |       |       |       |       |       |          |
|----|-------|-------|-------|-------|-------|-------|----------|
| 0  | 49167 | 44536 | 10052 | 68293 | 43115 | 18804 | 73177    |
| 1  | 16414 | 40215 | 94685 | 49288 | 83832 | 83186 | 1482     |
| 2  | -     | 26900 | 76840 | 23446 | 14045 | 42094 | 35286 69 |
| 3  | 24890 | 67627 | 96792 | 24664 | 83045 | 7524  |          |
| 4  | 13446 | 35727 | €1435 | 77751 | 14360 | 4350  |          |
| 5  | -     | 47320 | 54037 | 88584 | 77617 | 37861 | 63       |
| 6  | 92618 | 58591 | 31274 | 47775 | 06457 |       |          |
| 7  | -     | 73580 | 49304 | 98379 | 17705 | 063   |          |
| 8  | -     | 23031 | 40837 | 08323 | 48688 | 60    |          |
| 9  | 12140 | 03269 | 53800 | 34160 | 4     |       |          |
| 10 | -     | 31674 | 81426 | 31213 | 7994  |       |          |
| 11 | 51294 | 11976 | 21753 | 80    |       |       |          |
| 12 | -     | 21299 | 77185 | 23151 |       |       |          |
| 13 | -     | 19174 | 42965 | 7313  |       |       |          |
| 14 | 82869 | 31673 | 40    |       |       |       |          |
| 15 | -     | 21689 | 86512 | 8     |       |       |          |
| 16 | 36325 | 2581  |       |       |       |       |          |
| 17 | -     | 27720 | 53    |       |       |       |          |
| 18 | -     | 84372 |       |       |       |       |          |
| 19 | 4715  |       |       |       |       |       |          |
| 20 | -     | 139   |       |       |       |       |          |
| 21 | 2     |       |       |       |       |       |          |

S = 30.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49194   | 25787 | 39522 | 09054 | 56681 | 43791 | 38795 |
| 1  | 15892   | 07037 | 18679 | 71696 | 85337 | 24157 | 9215  |
| 2  | - 25218 | 25517 | 23653 | 48601 | 54785 | 65669 | 13    |
| 3  | 21971   | 66932 | 01357 | 43096 | 30471 | 3921  |       |
| 4  | 11836   | 77146 | 88259 | 73713 | 66052 | 1372  |       |
| 5  | - 40270 | 83710 | 96774 | 24400 | 31375 | 28    |       |
| 6  | 75979   | 78453 | 64706 | 10367 | 39921 |       |       |
| 7  | - 57044 | 27245 | 74506 | 04242 | 353   |       |       |
| 8  | - 18244 | 09512 | 28309 | 89896 | 40    |       |       |
| 9  | 91416   | 41982 | 11723 | 07902 |       |       |       |
| 10 | - 22850 | 26929 | 25017 | 2524  |       |       |       |
| 11 | 35129   | 37818 | 69060 | 36    |       |       |       |
| 12 | - 11539 | 77042 | 27992 |       |       |       |       |
| 13 | - 13256 | 78905 | 4536  |       |       |       |       |
| 14 | 53523   | 04498 | 51    |       |       |       |       |
| 15 | - 12897 | 18678 | 9     |       |       |       |       |
| 16 | 20768   | 0054  |       |       |       |       |       |
| 17 | - 12888 | 61    |       |       |       |       |       |
| 18 | - 54546 |       |       |       |       |       |       |
| 19 | 2668    |       |       |       |       |       |       |
| 20 | - 73    |       |       |       |       |       |       |
| 21 | 1       |       |       |       |       |       |       |

S = 31.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49219   | 39824 | 86694 | 45157 | 96516 | 24822 | 05925 |
| 1  | 15401   | 98897 | 23054 | 23E54 | 54E78 | 56977 | 4889  |
| 2  | - 23688 | 84525 | 14889 | 79822 | 76505 | 61130 | 97    |
| 3  | 19468   | E6782 | 42689 | 80E36 | 24E73 | 9391  |       |
| 4  | 10465   | 53E04 | 07E27 | 40502 | 70025 | 6410  |       |
| 5  | - 34444 | 80213 | 2E446 | 71E38 | 0E403 | 33    |       |
| 6  | 62722   | 601E2 | 38365 | 01192 | E1E42 |       |       |
| 7  | - 44574 | 21513 | 33362 | 37378 | 13C   |       |       |
| 8  | - 14538 | 92700 | 83491 | 9908E | 39    |       |       |
| 9  | E9426   | 84901 | 81015 | 5258E |       |       |       |
| 10 | - 16E50 | 937E4 | E6917 | 3036  |       |       |       |
| 11 | 24338   | 09E57 | 09325 | 03    |       |       |       |
| 12 | - 60311 | 00751 | 5827  |       |       |       |       |
| 13 | - 92335 | 18801 | 495   |       |       |       |       |
| 14 | 34992   | 74351 | E5    |       |       |       |       |
| 15 | - 80003 | 02191 |       |       |       |       |       |
| 16 | 12054   | 0E12  |       |       |       |       |       |
| 17 | - 58235 | 1     |       |       |       |       |       |
| 18 | - 34951 |       |       |       |       |       |       |
| 19 | 1528    |       |       |       |       |       |       |
| 20 | - 39    |       |       |       |       |       |       |

S = 32.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49243   | 01810 | 66850 | 29673 | €2044 | 97049 | 63380 |
| 1  | 14941   | 25791 | 21367 | 26760 | 99420 | 12267 | 1473  |
| 2  | - 22294 | 50490 | 86453 | 89747 | €6742 | 26091 | 66    |
| 3  | 17312   | 45335 | 20172 | 46156 | €6181 | 8279  |       |
| 4  | €2873   | 70345 | 04323 | 38922 | 77€58 | 164   |       |
| 5  | - 29€01 | 62710 | 79208 | 67379 | 25591 | 14    |       |
| 6  | 52084   | 59073 | 38193 | 59111 | 20€32 |       |       |
| 7  | - 35089 | 02658 | €1567 | 16109 | €82   |       |       |
| 8  | - 11653 | 23162 | 75093 | 96880 | 17    |       |       |
| 9  | 53151   | 74994 | 03632 | 99468 |       |       |       |
| 10 | - 12248 | 93072 | 04999 | 13€9  |       |       |       |
| 11 | 17045   | 88137 | €8470 | 30    |       |       |       |
| 12 | - 29418 | 453€6 | 4759  |       |       |       |       |
| 13 | - 64798 | 42852 | 301   |       |       |       |       |
| 14 | 23144   | 62890 | 14    |       |       |       |       |
| 15 | - 50300 | 43934 |       |       |       |       |       |
| 16 | 70961   | 4€7   |       |       |       |       |       |
| 17 | - 24815 | 5     |       |       |       |       |       |
| 18 | - 22335 |       |       |       |       |       |       |
| 19 | 886     |       |       |       |       |       |       |
| 20 | - 21    |       |       |       |       |       |       |

S = 33.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49265   | 25128 | 28170 | 01910 | 73207 | 22684 | 34258 |
| 1  | 14507   | 31500 | 69172 | 66511 | 40430 | 05833 | 3242  |
| 2  | - 21019 | 78031 | 74770 | 90835 | 11540 | 84107 | 43    |
| 3  | 15446   | 88548 | 58394 | 48154 | 65605 | 1897  |       |
| 4  | 82705   | 32289 | 70123 | 22247 | 38284 | 637   |       |
| 5  | - 25553 | 17740 | 12707 | 43983 | 06249 | 53    |       |
| 6  | 43491   | 21898 | 07211 | 16249 | 70261 |       |       |
| 7  | - 27815 | 49083 | 77174 | 28091 | 627   |       |       |
| 8  | - 93920 | 81444 | 76002 | 90376 | 2     |       |       |
| 9  | 41001   | 51393 | 51636 | 85289 |       |       |       |
| 10 | - 90914 | 62547 | 26511 | 312   |       |       |       |
| 11 | 12061   | 40829 | 24552 | 60    |       |       |       |
| 12 | - 12339 | 68110 | 6208  |       |       |       |       |
| 13 | - 45817 | 53025 | 327   |       |       |       |       |
| 14 | 15478   | 03432 | 78    |       |       |       |       |
| 15 | - 32031 | 70148 |       |       |       |       |       |
| 16 | 42333   | 646   |       |       |       |       |       |
| 17 | - 92914 |       |       |       |       |       |       |
| 18 | - 14287 |       |       |       |       |       |       |
| 19 | 520     |       |       |       |       |       |       |
| 20 | - 11    |       |       |       |       |       |       |

S = 34.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49286   | 21635 | 83132 | 72231 | 26151 | 92297 | 86181 |
| 1  | 14097   | 88809 | 11531 | 72361 | 30489 | 47831 | 3732  |
| 2  | - 19851 | 36687 | 20122 | 65076 | 45571 | 43956 | 97    |
| 3  | 13826   | 16890 | 60696 | 99477 | 34044 | 3768  |       |
| 4  | 73892   | 08342 | 06768 | 01680 | 15826 | 240   |       |
| 5  | - 22151 | 37599 | 26767 | 47227 | 06194 | 07    |       |
| 6  | 36505   | 82150 | 84971 | 98446 | 04860 |       |       |
| 7  | - 22195 | 13882 | 60446 | 90861 | 354   |       |       |
| 8  | - 76099 | 01575 | 22982 | 18119 | 3     |       |       |
| 9  | 31856   | 30138 | 02190 | 76965 |       |       |       |
| 10 | - 68050 | 14266 | 59134 | 753   |       |       |       |
| 11 | 86173   | 55095 | 73140 | 6     |       |       |       |
| 12 | - 31466 | 28803 | 569   |       |       |       |       |
| 13 | - 32638 | 85246 | 260   |       |       |       |       |
| 14 | 10460   | 35785 | 82    |       |       |       |       |
| 15 | - 20646 | 33038 |       |       |       |       |       |
| 16 | 25572   | 616   |       |       |       |       |       |
| 17 | - 23430 |       |       |       |       |       |       |
| 18 | - 9171  |       |       |       |       |       |       |
| 19 | 308     |       |       |       |       |       |       |
| 20 | - 6     |       |       |       |       |       |       |

S = 35.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49306   | 01877 | 31628 | 24058 | 77937 | 08930 | 59900 |
| 1  | 13710   | 95508 | 48273 | 89049 | 92139 | 41270 | 8092  |
| 2  | - 18777 | 76013 | 17383 | 76009 | 33014 | 31547 | 13    |
| 3  | 12412   | 69582 | 30105 | 37470 | 44211 | 7034  |       |
| 4  | 66222   | 80446 | 20594 | 42558 | 11706 | 748   |       |
| 5  | - 19278 | 85705 | 72278 | 12844 | 14531 | 03    |       |
| 6  | 30793   | 82608 | 32391 | 43339 | 75759 |       |       |
| 7  | - 17820 | 79125 | 36388 | 40841 | 739   |       |       |
| 8  | - 61972 | 88927 | 91896 | 18171 | 2     |       |       |
| 9  | 24919   | 47322 | 53200 | 92205 |       |       |       |
| 10 | - 51343 | 46264 | 35371 | 264   |       |       |       |
| 11 | 62132   | 57024 | 46179 | 3     |       |       |       |
| 12 | 15655   | 85116 | 568   |       |       |       |       |
| 13 | - 23421 | 60669 | 811   |       |       |       |       |
| 14 | 71404   | 80781 | 5     |       |       |       |       |
| 15 | - 13461 | 48901 |       |       |       |       |       |
| 16 | 15630   | 259   |       |       |       |       |       |
| 17 | 5415    |       |       |       |       |       |       |
| 18 | - 5915  |       |       |       |       |       |       |
| 19 | 185     |       |       |       |       |       |       |
| 20 | - 3     |       |       |       |       |       |       |

S = 36.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49324   | 75259 | 69300 | 39096 | 74E43 | 90849 | 97391 |
| 1  | 13344   | 71048 | 53992 | 11599 | 60E47 | 51923 | 5493  |
| 2  | - 17788 | 97117 | E4887 | 81077 | E4845 | 78891 | 33    |
| 3  | 11175   | 44483 | 28490 | 04924 | 79705 | 3722  |       |
| 4  | 59523   | 74261 | E6369 | 46E77 | 00E84 | 319   |       |
| 5  | - 16841 | 98454 | 43234 | 62567 | 52E55 | 68    |       |
| 6  | 26096   | 92387 | 92468 | 75509 | 89254 |       |       |
| 7  | - 14392 | 92593 | 30306 | 06632 | 382   |       |       |
| 8  | - 50715 | 14E95 | 75611 | 11968 | E     |       |       |
| 9  | 19619   | 04790 | 44518 | 48348 |       |       |       |
| 10 | - 39031 | 82816 | 08438 | 097   |       |       |       |
| 11 | 45188   | 09715 | 70854 | 0     |       |       |       |
| 12 | 37591   | 45107 | 758   |       |       |       |       |
| 13 | - 16927 | 95476 | 034   |       |       |       |       |
| 14 | 49210   | 33310 | 6     |       |       |       |       |
| 15 | - 88732 | 4634  |       |       |       |       |       |
| 16 | 96594   | 98    |       |       |       |       |       |
| 17 | 15464   |       |       |       |       |       |       |
| 18 | - 3838  |       |       |       |       |       |       |
| 19 | 112     |       |       |       |       |       |       |
| 20 | - 2     |       |       |       |       |       |       |

S = 37.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49342   | 50202 | 08147 | 51153 | 20398 | 99066 | 09837 |
| 1  | 12997   | 53710 | 99067 | 66061 | 58483 | 18113 | 6403  |
| 2  | - 16876 | 29313 | 39370 | 40051 | 71849 | 63966 | 67    |
| 3  | 10088   | 67954 | 89760 | 79064 | 55093 | 7393  |       |
| 4  | 53651   | 19149 | 08181 | 20145 | 91027 | 096   |       |
| 5  | - 14765 | 58303 | 93268 | 26512 | 42007 | 33    |       |
| 6  | 22214   | 24611 | 95089 | 85231 | 13168 |       |       |
| 7  | - 11689 | 35682 | 36849 | 04545 | 941   |       |       |
| 8  | - 41696 | 41550 | 26128 | 62550 | 4     |       |       |
| 9  | 15540   | 73134 | 33221 | 02867 |       |       |       |
| 10 | - 29885 | 54168 | 65504 | 654   |       |       |       |
| 11 | 33135   | 57170 | 38863 | 3     |       |       |       |
| 12 | 45653   | 27636 | 485   |       |       |       |       |
| 13 | - 12320 | 15601 | 401   |       |       |       |       |
| 14 | 34224   | 96305 | 2     |       |       |       |       |
| 15 | - 59099 | 0477  |       |       |       |       |       |
| 16 | 60319   | 03    |       |       |       |       |       |
| 17 | 17218   |       |       |       |       |       |       |
| 18 | - 2506  |       |       |       |       |       |       |
| 19 | 69      |       |       |       |       |       |       |
| 20 | - 1     |       |       |       |       |       |       |

S = 38.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49359   | 34262 | 08204 | 74729 | 68395 | 80876 | 24099 |
| 1  | 12667   | 98215 | 13860 | 49544 | 49680 | 56020 | 4084  |
| 2  | - 16032 | 10862 | 69644 | 62110 | 72875 | 76983 | 47    |
| 3  | 91309   | 48031 | 76159 | 52587 | 50838 | 743   |       |
| 4  | 48485   | 68804 | 75036 | 44578 | 57588 | 425   |       |
| 5  | - 12988 | 94652 | 68682 | 16464 | 53453 | 84    |       |
| 6  | 18988   | 52473 | 43775 | 40120 | 68017 |       |       |
| 7  | - 95439 | 51655 | 75949 | 70589 | 28    |       |       |
| 8  | - 34435 | 06235 | 37337 | 32908 | 4     |       |       |
| 9  | 12381   | 93765 | 89576 | 59436 |       |       |       |
| 10 | - 23038 | 56512 | 84564 | 870   |       |       |       |
| 11 | 24487   | 89407 | 27642 | 8     |       |       |       |
| 12 | 46342   | 40954 | 034   |       |       |       |       |
| 13 | - 90274 | 31523 | 70    |       |       |       |       |
| 14 | 24010   | 92338 | 2     |       |       |       |       |
| 15 | - 39753 | 2074  |       |       |       |       |       |
| 16 | 38036   | 08    |       |       |       |       |       |
| 17 | 15651   |       |       |       |       |       |       |
| 18 | - 1647  |       |       |       |       |       |       |
| 19 | 42      |       |       |       |       |       |       |

S = 39.5

I

O SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49375   | 34243 | 19681 | 37283 | 05524 | 81121 | 28175 |
| 1  | 12354   | 73679 | 98035 | 03844 | 38143 | 33723 | 8119  |
| 2  | - 15249 | 73014 | 31186 | 92316 | 04535 | 29607 | 59    |
| 3  | 82842   | 82797 | 22064 | 51597 | 93370 | 861   |       |
| 4  | 43927   | 44694 | 55285 | 73854 | 45459 | 092   |       |
| 5  | - 11462 | 77701 | 12903 | 36526 | 36131 | 76    |       |
| 6  | 16295   | 83211 | 88180 | 94912 | 94856 |       |       |
| 7  | - 78315 | 51996 | 53839 | 21545 | 97    |       |       |
| 8  | - 28560 | 40182 | 46717 | 30260 | 3     |       |       |
| 9  | 99199   | 14209 | 96626 | 0859  |       |       |       |
| 10 | - 17875 | 44176 | 53346 | 177   |       |       |       |
| 11 | 18231   | 77731 | 84787 | 6     |       |       |       |
| 12 | 43364   | 10526 | 821   |       |       |       |       |
| 13 | - 66582 | 18764 | 44    |       |       |       |       |
| 14 | 16985   | 80197 | 2     |       |       |       |       |
| 15 | - 26993 | 3902  |       |       |       |       |       |
| 16 | 24205   | 99    |       |       |       |       |       |
| 17 | 13045   |       |       |       |       |       |       |
| 18 | - 1090  |       |       |       |       |       |       |
| 19 | 26      |       |       |       |       |       |       |

S = 40.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49390   | 56286 | 57236 | 53039 | 02456 | 26194 | 15762 |
| 1  | 12056   | 61882 | 30882 | 81906 | 67722 | 58803 | 1671  |
| 2  | - 14523 | 26704 | 53250 | 97366 | 27394 | 50762 | 96    |
| 3  | 75335   | 71547 | 80458 | 37911 | 25268 | 360   |       |
| 4  | 39892   | 74024 | 09090 | 48994 | 87155 | 696   |       |
| 5  | - 10146 | 82860 | 41629 | 19210 | 72162 | 77    |       |
| 6  | 14037   | 91401 | 70364 | 30228 | 33164 |       |       |
| 7  | - 64571 | 91123 | 37286 | 00740 | 82    |       |       |
| 8  | - 23785 | 55277 | 68489 | 86262 | 9     |       |       |
| 9  | 79894   | 40069 | 30677 | 9124  |       |       |       |
| 10 | - 13955 | 02339 | 89860 | 587   |       |       |       |
| 11 | 13670   | 14527 | 71478 | 1     |       |       |       |
| 12 | 38797   | 61241 | 755   |       |       |       |       |
| 13 | - 49420 | 42955 | 50    |       |       |       |       |
| 14 | 12112   | 02579 | 3     |       |       |       |       |
| 15 | - 18494 | 7908  |       |       |       |       |       |
| 16 | 15537   | 88    |       |       |       |       |       |
| 17 | 10389   |       |       |       |       |       |       |
| 18 | - 727   |       |       |       |       |       |       |
| 19 | 17      |       |       |       |       |       |       |

S = 41.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49405   | 05949 | 66983 | 42874 | 66623 | 01213 | 96614 |
| 1  | 11772   | 55761 | 82611 | 41966 | 74518 | 53357 | 2293  |
| 2  | - 13847 | 51425 | 58822 | 98349 | 17800 | 44508 | 76    |
| 3  | 68660   | 48470 | 92451 | 42346 | 75495 | 135   |       |
| 4  | 36311   | 00978 | 30736 | 66909 | 11393 | 483   |       |
| 5  | - 90080 | 79682 | 89116 | 90977 | 62069 | 5     |       |
| 6  | 12136   | 41705 | 24353 | 21329 | 53106 |       |       |
| 7  | - 53483 | 20135 | 08178 | 47952 | 88    |       |       |
| 8  | - 19887 | 29824 | 89331 | 14891 | 4     |       |       |
| 9  | 64670   | 85287 | 63113 | 9920  |       |       |       |
| 10 | - 10958 | 51115 | 01422 | 084   |       |       |       |
| 11 | 10319   | 06985 | 29570 | 6     |       |       |       |
| 12 | 33778   | 57839 | 378   |       |       |       |       |
| 13 | - 36907 | 85487 | 91    |       |       |       |       |
| 14 | 87026   | 73436 |       |       |       |       |       |
| 15 | - 12781 | 2560  |       |       |       |       |       |
| 16 | 10054   | 68    |       |       |       |       |       |
| 17 | 8057    |       |       |       |       |       |       |
| 18 | - 488   |       |       |       |       |       |       |
| 19 | 10      |       |       |       |       |       |       |

S = 42.5

I

O SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49418   | 88273 | 58467 | 58461 | 73567 | 90697 | 01123 |
| 1  | 11501   | 58133 | 32565 | 72957 | 92502 | 97125 | 5235  |
| 2  | - 13217 | 85869 | 47964 | 87923 | 08134 | 05135 | 97    |
| 3  | 62708   | 86958 | 24584 | 88217 | 57824 | 847   |       |
| 4  | 33122   | 55112 | 10011 | 42541 | 46689 | 208   |       |
| 5  | - 80193 | 06123 | 79383 | 77649 | 77529 | 2     |       |
| 6  | 10528   | 51166 | 79513 | 00356 | 56410 |       |       |
| 7  | - 44491 | 56409 | 45394 | 27591 | 36    |       |       |
| 8  | - 16691 | 05422 | 19138 | 58371 | 0     |       |       |
| 9  | 52600   | 07708 | 49345 | 0427  |       |       |       |
| 10 | - 86537 | 24373 | 31250 | 10    |       |       |       |
| 11 | 78396   | 70898 | 43010 |       |       |       |       |
| 12 | 28898   | 48406 | 497   |       |       |       |       |
| 13 | - 27727 | 17295 | 64    |       |       |       |       |
| 14 | 62987   | 47113 |       |       |       |       |       |
| 15 | - 89056 | 654   |       |       |       |       |       |
| 16 | 65558   | 3     |       |       |       |       |       |
| 17 | 6150    |       |       |       |       |       |       |
| 18 | - 330   |       |       |       |       |       |       |
| 19 | 7       |       |       |       |       |       |       |

S = 43.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49432   | 07843 | 55380 | 33278 | 55378 | 54552 | 86183 |
| 1  | 11242   | 80573 | 22071 | 28102 | 50845 | 73064 | 5774  |
| 2  | - 12630 | 20023 | 21275 | 48478 | 42448 | 35119 | 20    |
| 3  | 57388   | 70157 | 13680 | 42917 | 55331 | 514   |       |
| 4  | 30276   | 64590 | 96979 | 26424 | 82494 | 008   |       |
| 5  | - 71579 | 60886 | 04175 | 96772 | 18854 | 6     |       |
| 6  | 91635   | 50592 | 00605 | 63382 | 4269  |       |       |
| 7  | - 37165 | 43863 | 41818 | 69089 | 72    |       |       |
| 8  | - 14059 | 58784 | 77E55 | 76E06 | 9     |       |       |
| 9  | 42979   | 15547 | 78381 | 6028  |       |       |       |
| 10 | - 68703 | 07816 | 79E78 | 77    |       |       |       |
| 11 | 59926   | 71323 | 06394 |       |       |       |       |
| 12 | 24438   | 74911 | 676   |       |       |       |       |
| 13 | - 20949 | 78E84 | 29    |       |       |       |       |
| 14 | 45908   | 15477 |       |       |       |       |       |
| 15 | - E2542 | 445   |       |       |       |       |       |
| 16 | 43047   | 8     |       |       |       |       |       |
| 17 | 4648    |       |       |       |       |       |       |
| 18 | - 224   |       |       |       |       |       |       |
| 19 | 4       |       |       |       |       |       |       |

S = 44.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49444   | 68835 | 67959 | 83453 | 02713 | 30489 | 98876 |
| 1  | 10995   | 42453 | 47779 | 35787 | 63028 | 59334 | 4301  |
| 2  | - 12080 | 88475 | 64759 | 81921 | 03237 | 45617 | 08    |
| 3  | 52621   | 22673 | 73117 | 35176 | 77262 | 288   |       |
| 4  | 27730   | 04832 | 48680 | 53129 | 26797 | 536   |       |
| 5  | - 64052 | 89114 | 05753 | 51739 | 98253 | 5     |       |
| 6  | 80005   | 01375 | 20230 | 24204 | 0521  |       |       |
| 7  | - 31168 | 98122 | 05606 | 79985 | 34    |       |       |
| 8  | - 11884 | 50297 | 99989 | 39451 | 4     |       |       |
| 9  | 35272   | 57148 | 47904 | 2901  |       |       |       |
| 10 | - 54823 | 80745 | 77410 | 38    |       |       |       |
| 11 | 46077   | 83623 | 92681 |       |       |       |       |
| 12 | 20507   | 75700 | 537   |       |       |       |       |
| 13 | - 15916 | 81144 | 46    |       |       |       |       |
| 14 | 33684   | 94864 |       |       |       |       |       |
| 15 | - 44254 | 289   |       |       |       |       |       |
| 16 | 28452   | 7     |       |       |       |       |       |
| 17 | 3493    |       |       |       |       |       |       |
| 18 | - 154   |       |       |       |       |       |       |
| 19 | 3       |       |       |       |       |       |       |

S = 45.5

I

C SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49456   | 75065 | 05234 | 33961 | 55498 | 83450 | 00080 |
| 1  | 10758   | 70100 | 67092 | 47464 | 55829 | 87500 | 6699  |
| 2  | - 11566 | 64716 | 83989 | 51060 | 48810 | 82392 | 20    |
| 3  | 48338   | 92232 | 40406 | 57320 | 11391 | 375   |       |
| 4  | 25445   | 75244 | 59523 | 79426 | 25152 | 240   |       |
| 5  | - 57456 | 25423 | 76497 | 93269 | 48432 | 5     |       |
| 6  | 70059   | 61495 | 93699 | 70419 | 7509  |       |       |
| 7  | - 26239 | 36490 | 04628 | 51655 | 36    |       |       |
| 8  | - 10079 | 77955 | 86570 | 23297 | 7     |       |       |
| 9  | 29069   | 90119 | 31981 | 5947  |       |       |       |
| 10 | - 43962 | 94650 | 82385 | 16    |       |       |       |
| 11 | 35629   | 01254 | 38094 |       |       |       |       |
| 12 | 17120   | 67926 | 096   |       |       |       |       |
| 13 | - 12157 | 74264 | 58    |       |       |       |       |
| 14 | 24875   | 71793 |       |       |       |       |       |
| 15 | - 31540 | 824   |       |       |       |       |       |
| 16 | 18920   | 5     |       |       |       |       |       |
| 17 | 2616    |       |       |       |       |       |       |
| 18 | - 106   |       |       |       |       |       |       |
| 19 | 1       |       |       |       |       |       |       |

S = 46.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49468   | 30022 | 25200 | 96861 | 07549 | 98580 | 02255 |
| 1  | 10531   | 96061 | €4268 | 26231 | 27145 | 8942€ | 9226  |
| 2  | - 11084 | 56271 | 66613 | 69845 | 99731 | 24994 | 25    |
| 3  | 44483   | 70066 | 75595 | 89311 | 32967 | 007   |       |
| 4  | 23391   | 98381 | 32319 | 38153 | 81442 | 832   |       |
| 5  | - 51658 | 32947 | 75876 | 30343 | 97410 | 1     |       |
| 6  | €1526   | 14835 | 27399 | 96432 | €171  |       |       |
| 7  | - 22169 | 79€14 | 42069 | €0109 | 28    |       |       |
| 8  | - 85768 | 45706 | 69869 | 93735 |       |       |       |
| 9  | 24054   | 79040 | 70937 | 1258  |       |       |       |
| 10 | - 35419 | 27773 | 72196 | 50    |       |       |       |
| 11 | 27€98   | 32574 | 93656 |       |       |       |       |
| 12 | 14245   | 54308 | 3€2   |       |       |       |       |
| 13 | - 93345 | 00849 | 7     |       |       |       |       |
| 14 | 18484   | 12€34 |       |       |       |       |       |
| 15 | - 22€36 | 070   |       |       |       |       |       |
| 16 | 12652   | 3     |       |       |       |       |       |
| 17 | 1957    |       |       |       |       |       |       |
| 18 | - 73    |       |       |       |       |       |       |
| 19 | 1       |       |       |       |       |       |       |

S = 47.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49479   | 36907 | 44723 | 74572 | 37847 | 11129 | 09437 |
| 1  | 10314   | 58460 | 32520 | 13322 | 60089 | 81903 | 6300  |
| 2  | - 10632 | 00528 | 96361 | 76216 | 77033 | 38746 | 79    |
| 3  | 41005   | 43175 | 61220 | 03090 | 23545 | 639   |       |
| 4  | 21541   | 37074 | 56422 | 36523 | 68286 | 894   |       |
| 5  | - 46548 | 53305 | 98494 | 06504 | 40691 | 5     |       |
| 6  | 54180   | 24626 | 55717 | 84506 | 0899  |       |       |
| 7  | - 18796 | 74035 | 36431 | 86035 | 72    |       |       |
| 8  | - 73207 | 99766 | 31250 | 11627 |       |       |       |
| 9  | 19982   | 05499 | 69719 | 5844  |       |       |       |
| 10 | - 28664 | 48288 | 39384 | 43    |       |       |       |
| 11 | 21644   | 39639 | 74887 |       |       |       |       |
| 12 | 11829   | 39058 | 663   |       |       |       |       |
| 13 | - 72026 | 84188 | 4     |       |       |       |       |
| 14 | 13816   | 62058 |       |       |       |       |       |
| 15 | - 16353 | 848   |       |       |       |       |       |
| 16 | 85040   |       |       |       |       |       |       |
| 17 | 1464    |       |       |       |       |       |       |
| 18 | - 51    |       |       |       |       |       |       |

S = 48.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49489   | 98659 | 97613 | 30527 | 99827 | 38709 | 74768 |
| 1  | 10106   | 00432 | 78127 | 87280 | 76878 | 15022 | 6746  |
| 2  | - 10206 | 61155 | 12096 | 73501 | 22104 | 02074 | 29    |
| 3  | 37860   | 72087 | 10286 | 33419 | 64727 | 106   |       |
| 4  | 19870   | 26049 | 91150 | 31272 | 90048 | 650   |       |
| 5  | - 42033 | 43842 | 51932 | 98726 | 14119 | 8     |       |
| 6  | 47836   | 84459 | 29736 | 27632 | 2718  |       |       |
| 7  | - 15990 | 21811 | 06598 | 38786 | 30    |       |       |
| 8  | - 62674 | 99610 | 56491 | 24374 |       |       |       |
| 9  | 16660   | 66926 | 06824 | 4795  |       |       |       |
| 10 | - 23298 | 14049 | 19383 | 06    |       |       |       |
| 11 | 16997   | 67968 | 96284 |       |       |       |       |
| 12 | 98127   | 38015 | 46    |       |       |       |       |
| 13 | - 55845 | 68126 | 8     |       |       |       |       |
| 14 | 10386   | 90310 |       |       |       |       |       |
| 15 | - 11890 | 971   |       |       |       |       |       |
| 16 | 57421   |       |       |       |       |       |       |
| 17 | 1096    |       |       |       |       |       |       |
| 18 | - 36    |       |       |       |       |       |       |

S = 49.5

I

C SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49500   | 17984 | 38421 | 47467 | 66502 | 87931 | 78713 |
| 1  | 99056   | 96295 | 83886 | 30354 | 84247 | 60028 | 725   |
| 2  | - 98062 | 50003 | 47868 | 27029 | 30485 | 98756 | 6     |
| 3  | 35011   | 89354 | 53041 | 96876 | 43721 | 319   |       |
| 4  | 18358   | 15266 | 65754 | 18612 | 85293 | 113   |       |
| 5  | - 38033 | 83869 | 20920 | 05766 | 52453 | 7     |       |
| 6  | 42342   | 68330 | 09836 | 83154 | 2338  |       |       |
| 7  | - 13646 | 44713 | 45014 | 33857 | 58    |       |       |
| 8  | - 53813 | 09281 | 17856 | 61348 |       |       |       |
| 9  | 13941   | 05076 | 16370 | 5751  |       |       |       |
| 10 | - 19015 | 03070 | 92335 | 36    |       |       |       |
| 11 | 13412   | 23926 | 10059 |       |       |       |       |
| 12 | 81372   | 09137 | 37    |       |       |       |       |
| 13 | - 43501 | 73169 | 7     |       |       |       |       |
| 14 | 78516   | 1051  |       |       |       |       |       |
| 15 | - 86993 | 53    |       |       |       |       |       |
| 16 | 38930   |       |       |       |       |       |       |
| 17 | 821     |       |       |       |       |       |       |
| 18 | - 25    |       |       |       |       |       |       |

S = 50.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49509   | 97373 | 40478 | 91297 | 10522 | 65562 | 39823 |
| 1  | 97131   | 77763 | 49335 | 48928 | 10268 | 59076 | 890   |
| 2  | - 94289 | 94217 | 53795 | 26508 | 37980 | 39321 | 3     |
| 3  | 32426   | 14948 | 28733 | 87971 | 45948 | 014   |       |
| 4  | 16987   | 22789 | 84978 | 01912 | 10349 | 966   |       |
| 5  | - 34482 | 35746 | 80186 | 81782 | 72872 | 7     |       |
| 6  | 37570   | 35070 | 54867 | 23378 | 9674  |       |       |
| 7  | - 11682 | 17938 | 82532 | 36165 | 83    |       |       |
| 8  | - 46333 | 47050 | 41002 | 05760 |       |       |       |
| 9  | 11705   | 50050 | 88019 | 5392  |       |       |       |
| 10 | - 15581 | 22508 | 87681 | 13    |       |       |       |
| 11 | 10631   | 64886 | 93955 |       |       |       |       |
| 12 | 67492   | 36828 | 05    |       |       |       |       |
| 13 | - 34039 | 08788 | 3     |       |       |       |       |
| 14 | 59666   | 6805  |       |       |       |       |       |
| 15 | - 64021 | 91    |       |       |       |       |       |
| 16 | 26488   |       |       |       |       |       |       |
| 17 | 617     |       |       |       |       |       |       |
| 18 | - 18    |       |       |       |       |       |       |

S = 51.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49519   | 39128 | 29253 | 99879 | 22394 | 87063 | 02850 |
| 1  | 95280   | 02846 | 44190 | 55839 | 72422 | 62650 | 458   |
| 2  | - 90730 | 99602 | 62952 | 13326 | 74031 | 45207 | 0     |
| 3  | 30074   | 85474 | 75978 | 54E26 | 43341 | 812   |       |
| 4  | 15741   | 95444 | 95985 | 29125 | 75909 | 942   |       |
| 5  | - 31321 | 49749 | 83E99 | 79004 | 2871E | 6     |       |
| 6  | 33413   | 53138 | 10167 | 62115 | 3254  |       |       |
| 7  | - 10030 | 348E0 | 83737 | 52183 | 55    |       |       |
| 8  | - 40001 | 15347 | 36957 | 96146 |       |       |       |
| 9  | 98609   | 74767 | 72951 | 045   |       |       |       |
| 10 | - 12816 | 49033 | 56409 | 96    |       |       |       |
| 11 | 84647   | 15449 | 2662  |       |       |       |       |
| 12 | 56015   | 46814 | 45    |       |       |       |       |
| 13 | - 26750 | 94975 | 3     |       |       |       |       |
| 14 | 45574   | 5243  |       |       |       |       |       |
| 15 | - 47385 | 73    |       |       |       |       |       |
| 16 | 18075   |       |       |       |       |       |       |
| 17 | 465     |       |       |       |       |       |       |
| 18 | - 13    |       |       |       |       |       |       |

S = 52.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49528   | 45376 | 85923 | 48868 | 81170 | 85001 | 15648 |
| 1  | 93497   | 59066 | 53584 | 28360 | 32996 | 20710 | 600   |
| 2  | - 87369 | 83168 | 98740 | 51262 | 53967 | 04111 | 7     |
| 3  | 27932   | 94755 | 59721 | 87729 | 84526 | 382   |       |
| 4  | 14608   | 75852 | €1403 | 54870 | 21401 | 330   |       |
| 5  | - 28502 | 04048 | 43057 | 34853 | 28375 | 5     |       |
| 6  | 29783   | 19724 | 79895 | 39901 | 9135  |       |       |
| 7  | - 86366 | 98704 | 94040 | 42602 | 4     |       |       |
| 8  | - 34624 | 27511 | 38790 | 59520 |       |       |       |
| 9  | 83335   | 90071 | €3076 | 878   |       |       |       |
| 10 | - 10581 | 26001 | 59555 | 68    |       |       |       |
| 11 | 67680   | 79145 | 4618  |       |       |       |       |
| 12 | 46534   | 32866 | 85    |       |       |       |       |
| 13 | - 21111 | 96496 | 1     |       |       |       |       |
| 14 | 34982   | 4768  |       |       |       |       |       |
| 15 | - 35265 | 83    |       |       |       |       |       |
| 16 | 12364   |       |       |       |       |       |       |
| 17 | 351     |       |       |       |       |       |       |
| 18 | - 9     |       |       |       |       |       |       |

S = 53.5

I

C SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49537   | 18089 | 50886 | 87129 | 04378 | 42412 | 36298 |
| 1  | 91780   | 64279 | 72605 | 89191 | 99858 | 65673 | 618   |
| 2  | - 84192 | 05985 | 64937 | 89762 | 10054 | 41215 | 4     |
| 3  | 25978   | 43776 | 39350 | 04463 | 99939 | 487   |       |
| 4  | 13575   | 74714 | 00070 | 09614 | 60089 | 184   |       |
| 5  | - 25981 | 72578 | 46993 | 51154 | 03652 | 6     |       |
| 6  | 26604   | 54133 | 55813 | 97143 | 9855  |       |       |
| 7  | - 74571 | 60149 | 24740 | 66188 | 7     |       |       |
| 8  | - 30045 | 60813 | 59751 | 40188 |       |       |       |
| 9  | 70644   | 23963 | 26303 | 458   |       |       |       |
| 10 | - 87669 | 32056 | 33904 | 5     |       |       |       |
| 11 | 54336   | 62137 | 6620  |       |       |       |       |
| 12 | 38704   | 11811 | 06    |       |       |       |       |
| 13 | - 16729 | 66071 | 0     |       |       |       |       |
| 14 | 26980   | 0131  |       |       |       |       |       |
| 15 | - 26385 | 37    |       |       |       |       |       |
| 16 | 8470    |       |       |       |       |       |       |
| 17 | 265     |       |       |       |       |       |       |
| 18 | - 6     |       |       |       |       |       |       |

S = 54.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49545   | 59093 | 52640 | 12833 | 09685 | 16596 | 01897 |
| 1  | 90125   | 63936 | 97907 | 85300 | 52906 | 78799 | 901   |
| 2  | - 81184 | 57545 | 08354 | 55153 | 38822 | 00642 | 6     |
| 3  | 24191   | 98391 | 12410 | 05518 | 61820 | 813   |       |
| 4  | 12632   | 47433 | 69808 | 01199 | 48201 | 356   |       |
| 5  | - 23724 | 18195 | 03158 | 82113 | 49085 | 9     |       |
| 6  | 23814   | 49906 | 86765 | 23725 | 6313  |       |       |
| 7  | - 64557 | 98701 | 66924 | 22960 | 0     |       |       |
| 8  | - 26135 | 86617 | 27986 | 76972 |       |       |       |
| 9  | 60062   | 89751 | 19096 | 050   |       |       |       |
| 10 | - 72886 | 02445 | 05492 | 6     |       |       |       |
| 11 | 43795   | 59092 | 0790  |       |       |       |       |
| 12 | 32235   | 95739 | 94    |       |       |       |       |
| 13 | - 13309 | 38622 | 8     |       |       |       |       |
| 14 | 20903   | 8255  |       |       |       |       |       |
| 15 | - 19842 | 41    |       |       |       |       |       |
| 16 | 5808    |       |       |       |       |       |       |
| 17 | 201     |       |       |       |       |       |       |
| 18 | - 4     |       |       |       |       |       |       |

S = 55.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49553   | 70085 | 83800 | 67574 | 42291 | 65278 | 91473 |
| 1  | 88529   | 28636 | 81788 | 43853 | 03482 | 10412 | 577   |
| 2  | - 78335 | 42424 | 65895 | 40263 | 87452 | 87276 | 2     |
| 3  | 22556   | 534E9 | 28511 | 08022 | 60781 | 547   |       |
| 4  | 11769   | 74338 | 43711 | 04401 | 33E93 | 110   |       |
| 5  | - 21E97 | 98411 | 23763 | 42452 | 0E735 | 5     |       |
| 6  | 21359   | 73E42 | 59369 | 2848E | 85E6  |       |       |
| 7  | - 56032 | 04214 | 83242 | 41245 | 4     |       |       |
| 8  | - 22788 | 393E7 | 85252 | 97E41 |       |       |       |
| 9  | 51212   | 47325 | 23453 | 679   |       |       |       |
| 10 | - 60795 | 93989 | 92543 | 8     |       |       |       |
| 11 | 35433   | 8E1E9 | 7935  |       |       |       |       |
| 12 | 26889   | 69801 | 01    |       |       |       |       |
| 13 | - 10628 | 87138 | 3     |       |       |       |       |
| 14 | 16267   | 98E2  |       |       |       |       |       |
| 15 | - 14995 | 87    |       |       |       |       |       |
| 16 | 3982    |       |       |       |       |       |       |
| 17 | 153     |       |       |       |       |       |       |
| 18 | - 3     |       |       |       |       |       |       |

S = 56.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49561   | 52644 | 43022 | 39673 | 75086 | 62641 | 76136 |
| 1  | 86988   | 51633 | 88509 | 43455 | 65467 | 23303 | 934   |
| 2  | - 75633 | 68283 | 12996 | 32045 | 60559 | 67913 | 4     |
| 3  | 21057   | 02413 | 19595 | 52249 | 39609 | 188   |       |
| 4  | 10979   | 43887 | 42727 | 64611 | 74248 | 286   |       |
| 5  | - 19875 | 94290 | 51502 | 50295 | 03637 | 8     |       |
| 6  | 19195   | 01069 | 52634 | 75079 | 6075  |       |       |
| 7  | - 48752 | 19500 | 53957 | 78115 | 9     |       |       |
| 8  | - 19914 | 90359 | 69128 | 33689 |       |       |       |
| 9  | 43786   | 73051 | 87198 | 962   |       |       |       |
| 10 | - 50873 | 15212 | 46175 | 6     |       |       |       |
| 11 | 28773   | 97211 | 7522  |       |       |       |       |
| 12 | 22466   | 76187 | 78    |       |       |       |       |
| 13 | - 85196 | 67125 |       |       |       |       |       |
| 14 | 12714   | 5760  |       |       |       |       |       |
| 15 | - 11387 | 32    |       |       |       |       |       |
| 16 | 2727    |       |       |       |       |       |       |
| 17 | 117     |       |       |       |       |       |       |
| 18 | - 2     |       |       |       |       |       |       |

S = 57.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49569   | 08238 | 58959 | 63127 | 63620 | 79331 | 74502 |
| 1  | 85500   | 48272 | 80965 | 06116 | 56117 | 23109 | 791   |
| 2  | - 73069 | 35390 | 27739 | 86049 | 58846 | 91632 | 8     |
| 3  | 19680   | 11166 | 15933 | 44234 | 47716 | 404   |       |
| 4  | 10254   | 38379 | 77979 | 88676 | 17896 | 855   |       |
| 5  | - 18234 | 45740 | 16542 | 73888 | 99221 | 3     |       |
| 6  | 17281   | 82982 | 61653 | 00443 | 2625  |       |       |
| 7  | - 42519 | 33201 | 14439 | 84924 | 6     |       |       |
| 8  | - 17442 | 10181 | 42155 | 36689 |       |       |       |
| 9  | 37537   | 56416 | 48518 | 146   |       |       |       |
| 10 | - 42701 | 10252 | 66061 | 5     |       |       |       |
| 11 | 23448   | 77733 | 0055  |       |       |       |       |
| 12 | 18803   | 53960 | 29    |       |       |       |       |
| 13 | - 68535 | 37306 |       |       |       |       |       |
| 14 | 99785   | 821   |       |       |       |       |       |
| 15 | - 86871 | 2     |       |       |       |       |       |
| 16 | 1863    |       |       |       |       |       |       |
| 17 | 90      |       |       |       |       |       |       |
| 18 | - 1     |       |       |       |       |       |       |

S = 58.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49576   | 38238 | 10251 | 77273 | 30731 | 75931 | 33578 |
| 1  | 84062   | 51720 | 80064 | 89603 | 42577 | 51248 | 041   |
| 2  | - 70633 | 27361 | 15465 | 54783 | 40098 | 42512 | 1     |
| 3  | 18413   | 95988 | 02945 | 70124 | 41980 | 016   |       |
| 4  | 95882   | 17530 | 1E448 | 31261 | 21E26 | 94    |       |
| 5  | - 15752 | 9E390 | 53807 | 65817 | 45749 | 4     |       |
| 6  | 15587   | 35203 | 48610 | 41318 | 3554  |       |       |
| 7  | - 37168 | 78546 | 66948 | 88789 | 3     |       |       |
| 8  | - 15308 | 94952 | 3E314 | E9863 |       |       |       |
| 9  | 32263   | 23951 | 58544 | 031   |       |       |       |
| 10 | - 35948 | 51007 | 90008 | 3     |       |       |       |
| 11 | 19174   | 68196 | 7986  |       |       |       |       |
| 12 | 15765   | 55289 | 02    |       |       |       |       |
| 13 | - 55324 | 31521 |       |       |       |       |       |
| 14 | 78627   | 843   |       |       |       |       |       |
| 15 | - E6568 | 5     |       |       |       |       |       |
| 16 | 1267    |       |       |       |       |       |       |
| 17 | 69      |       |       |       |       |       |       |
| 18 | - 1     |       |       |       |       |       |       |

S = 59.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49583   | 43921 | 53640 | 39581 | 18245 | 54372 | 05685 |
| 1  | 82672   | 13375 | 91622 | 24760 | 31786 | 92853 | 662   |
| 2  | - 68317 | 02954 | 22738 | 89339 | 34599 | 30097 | 2     |
| 3  | 17248   | 04400 | 93153 | 77512 | 92295 | 567   |       |
| 4  | 89752   | 91381 | 17961 | 52251 | 40621 | 53    |       |
| 5  | - 15413 | 64469 | 04271 | 48205 | 25324 | 6     |       |
| 6  | 14083   | 47946 | 54431 | 28209 | 0355  |       |       |
| 7  | - 32563 | 93374 | 57128 | 03980 | 6     |       |       |
| 8  | - 13464 | 46641 | 69180 | 96619 |       |       |       |
| 9  | 27799   | 15324 | 03438 | 883   |       |       |       |
| 10 | - 30350 | 88604 | 78839 | 4     |       |       |       |
| 11 | 15731   | 66859 | 0051  |       |       |       |       |
| 12 | 13242   | 42737 | 21    |       |       |       |       |
| 13 | - 44810 | 61031 |       |       |       |       |       |
| 14 | 62196   | 923   |       |       |       |       |       |
| 15 | - 51231 | 6     |       |       |       |       |       |
| 16 | 857     |       |       |       |       |       |       |
| 17 | 53      |       |       |       |       |       |       |
| 18 | - 1     |       |       |       |       |       |       |

S = 60.5

I

O SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49590   | 26483 | 70745 | 01432 | 10722 | 99491 | 49583 |
| 1  | 81327   | 00930 | 96235 | 31143 | 42011 | 81673 | 033   |
| 2  | - 66112 | 88796 | 04175 | 62318 | 20974 | 66000 | 8     |
| 3  | 16172   | 98810 | 42460 | 80229 | 20202 | 669   |       |
| 4  | 84105   | 78945 | 22961 | 17655 | 32239 | 89    |       |
| 5  | - 14200 | 75616 | 28551 | 39985 | 09862 | 9     |       |
| 6  | 12746   | 10917 | 81309 | 78946 | 0229  |       |       |
| 7  | - 28591 | 06993 | 03013 | 87782 | 3     |       |       |
| 8  | - 11865 | 95212 | 78615 | 60020 |       |       |       |
| 9  | 24010   | 54561 | 38540 | 829   |       |       |       |
| 10 | - 25696 | 23932 | 82758 | 4     |       |       |       |
| 11 | 12948   | 32241 | 0092  |       |       |       |       |
| 12 | 11143   | 63890 | 86    |       |       |       |       |
| 13 | - 36413 | 76271 |       |       |       |       |       |
| 14 | 49384   | 819   |       |       |       |       |       |
| 15 | - 39593 | 5     |       |       |       |       |       |
| 16 | 574     |       |       |       |       |       |       |
| 17 | 41      |       |       |       |       |       |       |

S = 61.5

I

O SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49596   | 87042 | 42667 | 54590 | 76649 | 98535 | 99925 |
| 1  | 80024   | 96875 | 54915 | 64665 | 21319 | 03909 | 329   |
| 2  | - 64013 | 72914 | 69373 | 83856 | 00681 | 33386 | 8     |
| 3  | 15180   | 42391 | 03182 | 31568 | 47154 | 232   |       |
| 4  | 78895   | 98956 | 60203 | 76425 | 45730 | 76    |       |
| 5  | - 13100 | 61461 | 59817 | 67100 | 34265 | 5     |       |
| 6  | 11554   | 51214 | 68968 | 39777 | 6564  |       |       |
| 7  | - 25155 | 27221 | 16808 | 15700 | 9     |       |       |
| 8  | - 10477 | 54284 | 21221 | 48114 |       |       |       |
| 9  | 20786   | 72938 | 97511 | 956   |       |       |       |
| 10 | - 21814 | 08422 | 37583 | 3     |       |       |       |
| 11 | 10690   | 54840 | 5784  |       |       |       |       |
| 12 | 93949   | 57755 | 4     |       |       |       |       |
| 13 | - 29684 | 40161 |       |       |       |       |       |
| 14 | 39354   | 962   |       |       |       |       |       |
| 15 | - 30723 | 4     |       |       |       |       |       |
| 16 | 379     |       |       |       |       |       |       |
| 17 | 32      |       |       |       |       |       |       |

S = 62.5

| I  | 0 SUB I |       |       |       |       |       |       |  |  |
|----|---------|-------|-------|-------|-------|-------|-------|--|--|
| 0  | 49603   | 26644 | 60432 | 93157 | 19573 | 69992 | 01163 |  |  |
| 1  | 78763   | 97421 | 03917 | 72168 | 97303 | 79949 | 298   |  |  |
| 2  | - 62012 | 98980 | 93887 | 07799 | 10729 | 82529 | 9     |  |  |
| 3  | 14262   | 86893 | 50148 | 72661 | 75124 | 430   |       |  |  |
| 4  | 74083   | 48741 | 25188 | 82074 | 20898 | 21    |       |  |  |
| 5  | - 12101 | 17991 | 68992 | 73632 | 75019 | 1     |       |  |  |
| 6  | 10490   | 81677 | 46780 | 54340 | 9624  |       |       |  |  |
| 7  | - 22177 | 06857 | 15256 | 02568 | 1     |       |       |  |  |
| 8  | - 92690 | 36145 | 93365 | 0415  |       |       |       |  |  |
| 9  | 18036   | 50225 | 74618 | 033   |       |       |       |  |  |
| 10 | - 18566 | 78103 | 34168 | 3     |       |       |       |  |  |
| 11 | 88530   | 30870 | 417   |       |       |       |       |  |  |
| 12 | 79355   | 01286 | 4     |       |       |       |       |  |  |
| 13 | - 24273 | 30771 |       |       |       |       |       |  |  |
| 14 | 31473   | 041   |       |       |       |       |       |  |  |
| 15 | - 23934 | 3     |       |       |       |       |       |  |  |
| 16 | 246     |       |       |       |       |       |       |  |  |
| 17 | 25      |       |       |       |       |       |       |  |  |

S = 63.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49609   | 46271 | 78273 | 95559 | 36570 | 58796 | 19400 |
| 1  | 77542   | 11435 | 02041 | 17527 | 63437 | 36545 | 439   |
| 2  | - 60104 | 61169 | 79786 | 05501 | 22602 | 77827 | 7     |
| 3  | 13413   | 62087 | 35397 | 94368 | 73641 | 109   |       |
| 4  | 69632   | 46671 | 86931 | 97267 | 34657 | 45    |       |
| 5  | - 11191 | 85920 | 34062 | 71115 | 17842 | 7     |       |
| 6  | 95395   | 78032 | 74528 | 21476 | 042   |       |       |
| 7  | - 19589 | 73362 | 46131 | 45478 | 7     |       |       |
| 8  | - 82149 | 31277 | 17166 | 6380  |       |       |       |
| 9  | 15684   | 48670 | 22761 | 889   |       |       |       |
| 10 | - 15842 | 84774 | 03923 | 1     |       |       |       |
| 11 | 73527   | 39739 | 533   |       |       |       |       |
| 12 | 67153   | 05736 | 6     |       |       |       |       |
| 13 | - 19908 | 06575 |       |       |       |       |       |
| 14 | 25256   | 022   |       |       |       |       |       |
| 15 | - 18716 | 5     |       |       |       |       |       |
| 16 | 155     |       |       |       |       |       |       |
| 17 | 19      |       |       |       |       |       |       |

S = 64.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49615   | 46845 | 15907 | 06711 | 11065 | 53256 | 44996 |
| 1  | 76357   | 59473 | 57342 | 92760 | 32585 | 24409 | 201   |
| 2  | - 58282 | 99567 | 40451 | 71805 | 80235 | 70665 | 6     |
| 3  | 12626   | 66598 | 55442 | 35797 | 54220 | 145   |       |
| 4  | 65510   | 82292 | 71577 | 99172 | 87435 | 19    |       |
| 5  | - 10363 | 31407 | 72878 | 18464 | 07478 | 4     |       |
| 6  | 86874   | 16974 | 51814 | 51965 | 855   |       |       |
| 7  | - 17337 | 09044 | 79042 | 56110 | 8     |       |       |
| 8  | - 72936 | 42918 | 77941 | 4709  |       |       |       |
| 9  | 13668   | 19935 | 74186 | 063   |       |       |       |
| 10 | - 13551 | 68453 | 97891 | 2     |       |       |       |
| 11 | 61239   | 71662 | 956   |       |       |       |       |
| 12 | 56933   | 33965 | 1     |       |       |       |       |
| 13 | - 16375 | 39158 |       |       |       |       |       |
| 14 | 20334   | 528   |       |       |       |       |       |
| 15 | - 14690 | 4     |       |       |       |       |       |
| 16 | 93      |       |       |       |       |       |       |
| 17 | 15      |       |       |       |       |       |       |

S = 65.5

I

D SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49621   | 29230 | 15202 | 01964 | 72149 | 39915 | 51095 |
| 1  | 75208   | 72901 | 01652 | 97879 | 75594 | 50598 | 891   |
| 2  | - 56542 | 96057 | £5735 | 95355 | £144€ | 0€19€ | 0     |
| 3  | 11896   | 59940 | 39356 | 47756 | 3783€ | 14€   |       |
| 4  | €1689   | 72944 | 82169 | 55090 | £7544 | 29    |       |
| 5  | - 96072 | 95519 | 93012 | 30454 | 83847 |       |       |
| 6  | 79227   | 18272 | 38103 | 20569 | 762   |       |       |
| 7  | - 15371 | 71724 | 36327 | 14725 | 5     |       |       |
| 8  | - 64868 | 55256 | 42314 | 2486  |       |       |       |
| 9  | 11935   | 69633 | 47353 | 397   |       |       |       |
| 10 | - 11€19 | 42490 | £8469 | 8     |       |       |       |
| 11 | 51145   | 47115 | 168   |       |       |       |       |
| 12 | 48358   | 456€4 | 0     |       |       |       |       |
| 13 | - 13507 | 70004 |       |       |       |       |       |
| 14 | 16424   | 94€   |       |       |       |       |       |
| 15 | - 11571 | 8     |       |       |       |       |       |
| 16 | 52      |       |       |       |       |       |       |
| 17 | 12      |       |       |       |       |       |       |

S = 66.5

I

C SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49E26   | 94240 | 56003 | 94E23 | 29183 | 91598 | 40251 |
| 1  | 74093   | 93088 | 03835 | 50995 | 01280 | 26619 | 458   |
| 2  | - 54879 | 70E34 | 26270 | 24388 | 83224 | 70899 | 6     |
| 3  | 11218   | 555E7 | 35230 | 91E34 | 79550 | 674   |       |
| 4  | 58143   | 2E299 | 29211 | 85E42 | 49366 | 35    |       |
| 5  | - 89165 | 048E3 | 26E74 | 43E39 | 95C17 |       |       |
| 6  | 72353   | 75739 | 85509 | 82314 | E93   |       |       |
| 7  | - 13653 | 479E6 | 77537 | 73E76 | 1     |       |       |
| 8  | - 57789 | 89756 | 04175 | 8202  |       |       |       |
| 9  | 10443   | 674E8 | 59402 | 414   |       |       |       |
| 10 | - 99856 | 56807 | E8462 |       |       |       |       |
| 11 | 42828   | 82119 | E49   |       |       |       |       |
| 12 | 41150   | 6EE03 | E     |       |       |       |       |
| 13 | - 11172 | 85550 |       |       |       |       |       |
| 14 | 13308   | 652   |       |       |       |       |       |
| 15 | - 91470 |       |       |       |       |       |       |
| 16 | 24      |       |       |       |       |       |       |
| 17 | 9       |       |       |       |       |       |       |

S = 67.5

I

C SUE I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49632   | 42642 | 35307 | 42414 | 70922 | 42226 | 37726 |
| 1  | 73011   | 70680 | 19143 | 30807 | 61617 | 05017 | 063   |
| 2  | - 53288 | 78082 | 73243 | 74662 | 86607 | 97480 | 3     |
| 3  | 10588   | 14608 | 06705 | 26572 | 23504 | 214   |       |
| 4  | 54848   | 06953 | 46571 | 07017 | 80643 | 05    |       |
| 5  | - 82844 | 68865 | 29058 | 60789 | 75649 |       |       |
| 6  | 66165   | 77655 | 27637 | 78065 | 106   |       |       |
| 7  | - 12148 | 32601 | 40264 | 94640 | 3     |       |       |
| 8  | - 51567 | 65419 | 11642 | 5774  |       |       |       |
| 9  | 91559   | 38639 | 83801 | 45    |       |       |       |
| 10 | - 86008 | 22170 | 33806 |       |       |       |       |
| 11 | 35957   | 24499 | 420   |       |       |       |       |
| 12 | 35081   | 03289 | 5     |       |       |       |       |
| 13 | - 92663 | 2084  |       |       |       |       |       |
| 14 | 10816   | 475   |       |       |       |       |       |
| 15 | - 72548 |       |       |       |       |       |       |
| 16 | 7       |       |       |       |       |       |       |
| 17 | 7       |       |       |       |       |       |       |

S = 68.5

I

D SUB I

|   |         |       |       |       |       |       |       |
|---|---------|-------|-------|-------|-------|-------|-------|
| 0 | 49637   | 75157 | 13495 | 83528 | 90360 | 32894 | 92365 |
| 1 | 71960   | 64929 | 64607 | 42962 | 39912 | 06612 | 545   |
| 2 | - 51766 | 05000 | 02083 | 94777 | 05842 | 51152 | 5     |
| 3 | 10001   | 41555 | 46870 | 36267 | 78735 | 586   |       |
| 4 | 51783   | 08167 | 00049 | 67913 | 65072 | 54    |       |
| 5 | - 77054 | 39398 | 23516 | 19015 | 79802 |       |       |
| 6 | 60586   | 25193 | 50095 | 53987 | 293   |       |       |
| 7 | - 10827 | 29524 | 63659 | 42443 | 5     |       |       |
| 8 | - 46088 | 34462 | 60054 | 6495  |       |       |       |
| 9 | 80421   | 50987 | 28691 | 08    |       |       |       |
| 0 | - 74241 | 47188 | 92783 |       |       |       |       |
| 1 | 30263   | 97113 | 340   |       |       |       |       |
| 2 | 29960   | 58271 | 4     |       |       |       |       |
| 3 | - 77051 | 2082  |       |       |       |       |       |
| 4 | 88170   | 21    |       |       |       |       |       |
| 5 | - 57730 |       |       |       |       |       |       |
| 6 | - 3     |       |       |       |       |       |       |
| 7 | 5       |       |       |       |       |       |       |

S = 69.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49642   | 92465 | 30935 | 50926 | 92970 | 72436 | 36605 |
| 1  | 70939   | 43083 | 91149 | 58181 | 93078 | 72003 | 609   |
| 2  | - 50307 | 67103 | 91500 | 15677 | 60334 | 37581 | 4     |
| 3  | 94547   | 76105 | 18598 | 58060 | 06612 | 59    |       |
| 4  | 48929   | 26417 | 04117 | 20814 | 02469 | 65    |       |
| 5  | - 71743 | 01885 | 53052 | 18168 | 47748 |       |       |
| 6  | 55547   | 78474 | 36551 | 61587 | 358   |       |       |
| 7  | - 96656 | 97928 | 41570 | 87890 |       |       |       |
| 8  | - 41254 | 79691 | 14633 | 3642  |       |       |       |
| 9  | 70768   | 22369 | 90712 | 79    |       |       |       |
| 10 | - 64219 | 89436 | 70044 |       |       |       |       |
| 11 | 25534   | 29453 | 810   |       |       |       |       |
| 12 | 25633   | 09071 | 4     |       |       |       |       |
| 13 | - 64231 | 8380  |       |       |       |       |       |
| 14 | 72078   | 69    |       |       |       |       |       |
| 15 | - 46086 |       |       |       |       |       |       |
| 16 | - 10    |       |       |       |       |       |       |
| 17 | 4       |       |       |       |       |       |       |

S = 70.5

I

C SUB I

|    |         |       |       |       |       |       |       |
|----|---------|-------|-------|-------|-------|-------|-------|
| 0  | 49647   | 95208 | 97843 | 96657 | 19022 | 86389 | 53791 |
| 1  | 69946   | 79825 | 93663 | 21449 | 35543 | 58835 | 828   |
| 2  | - 48910 | 06805 | 76912 | 22969 | 48174 | 77323 | 9     |
| 3  | 89449   | 85613 | 42174 | 45730 | 13743 | 52    |       |
| 4  | 46269   | 39337 | 03872 | 80787 | 46245 | 32    |       |
| 5  | - 66864 | 98041 | 87161 | 82126 | 97001 |       |       |
| 6  | 50991   | 25709 | 54133 | 62995 | 252   |       |       |
| 7  | - 86424 | 38027 | 09133 | 86902 |       |       |       |
| 8  | - 36983 | 62470 | 06764 | 2728  |       |       |       |
| 9  | 62384   | 82341 | 35920 | 07    |       |       |       |
| 10 | - 55665 | 13548 | 47927 |       |       |       |       |
| 11 | 21594   | 87880 | 851   |       |       |       |       |
| 12 | 21969   | 20331 | 6     |       |       |       |       |
| 13 | - 53677 | 3398  |       |       |       |       |       |
| 14 | 59089   | 00    |       |       |       |       |       |
| 15 | - 36904 |       |       |       |       |       |       |
| 16 | - 14    |       |       |       |       |       |       |
| 17 | 3       |       |       |       |       |       |       |

B L A N K      P A G E

## APPENDIX B

VALUES OF  $\pi_{s+\frac{1}{2}}(s)$ ,  $\pi_{s-\frac{1}{2}}(s)$ , AND  $\pi_{s+\frac{1}{2}}(s-\frac{1}{2})$

**Table 2**  
 $\Pi_{s+\frac{1}{2}}(s)$  to 33 Decimal Places for  $s = 1(1)70$

| $s$ | $\Pi_{s+\frac{1}{2}}(s)$ |       |       |       |       |       |     |  |  |
|-----|--------------------------|-------|-------|-------|-------|-------|-----|--|--|
| 1   | 0.25396                  | 60243 | 36788 | 20750 | 56056 | 53722 | 937 |  |  |
| 2   | 0.33669                  | 72531 | 21326 | 33052 | 39065 | 52592 | 747 |  |  |
| 3   | 0.37739                  | 01650 | 32642 | 25053 | 28934 | 28843 | 737 |  |  |
| 4   | 0.40173                  | 03517 | 64841 | 97396 | 78340 | 54278 | 770 |  |  |
| 5   | 0.41796                  | 33353 | 81213 | 50477 | 67451 | 18172 | 270 |  |  |
| 6   | 0.42957                  | 44054 | 08420 | 88661 | 52478 | 09003 | 143 |  |  |
| 7   | 0.43829                  | 68276 | 00080 | 50735 | 72035 | 28556 | 068 |  |  |
| 8   | 0.44509                  | 17430 | 33055 | 82684 | 67839 | 67611 | 405 |  |  |
| 9   | 0.45053                  | 57084 | 17628 | 08803 | 40365 | 66524 | 242 |  |  |
| 10  | 0.45499                  | 58297 | 22878 | 02037 | 88149 | 41388 | 062 |  |  |
| 11  | 0.45871                  | 70733 | 35319 | 26019 | 01596 | 70103 | 652 |  |  |
| 12  | 0.46186                  | 92180 | 24929 | 63478 | 86583 | 59948 | 837 |  |  |
| 13  | 0.46457                  | 36744 | 19608 | 58169 | 91971 | 88658 | 530 |  |  |
| 14  | 0.46691                  | 95794 | 50527 | 74521 | 58812 | 11605 | 372 |  |  |
| 15  | 0.46897                  | 38604 | 17063 | 95826 | 81836 | 78368 | 279 |  |  |
| 16  | 0.47078                  | 77515 | 49129 | 63069 | 02295 | 76232 | 624 |  |  |
| 17  | 0.47240                  | 11418 | 71375 | 07706 | 20431 | 16784 | 742 |  |  |
| 18  | 0.47384                  | 55526 | 12607 | 69632 | 11509 | 96658 | 509 |  |  |
| 19  | 0.47514                  | 62232 | 27486 | 17457 | 97423 | 93853 | 670 |  |  |
| 20  | 0.47632                  | 36027 | 23779 | 54489 | 89949 | 22269 | 366 |  |  |
| 21  | 0.47739                  | 44352 | 03761 | 04174 | 34321 | 45689 | 445 |  |  |
| 22  | 0.47837                  | 25628 | 98030 | 96127 | 40379 | 11671 | 212 |  |  |
| 23  | 0.47926                  | 95289 | 32518 | 38208 | 77263 | 23631 | 182 |  |  |
| 24  | 0.48009                  | 50357 | 91386 | 22969 | 70138 | 23806 | 071 |  |  |
| 25  | 0.48085                  | 72982 | 46722 | 89182 | 45677 | 79632 | 100 |  |  |
| 26  | 0.48156                  | 33180 | 57591 | 06010 | 50027 | 93295 | 953 |  |  |
| 27  | 0.48221                  | 90999 | 53978 | 42790 | 89387 | 99691 | 904 |  |  |
| 28  | 0.48282                  | 98230 | 47366 | 15605 | 66563 | 57543 | 852 |  |  |
| 29  | 0.48339                  | 99780 | 45520 | 00494 | 16069 | 92377 | 752 |  |  |
| 30  | 0.48393                  | 34799 | 76090 | 64278 | 32422 | 96684 | 640 |  |  |
| 31  | 0.48443                  | 37482 | 01161 | 73395 | 36992 | 47357 | 434 |  |  |
| 32  | 0.48490                  | 38001 | 05871 | 69671 | 38710 | 92890 | 412 |  |  |
| 33  | 0.48534                  | 62918 | 14923 | 88215 | 17010 | 07630 | 086 |  |  |
| 34  | 0.48576                  | 35785 | 25715 | 34375 | 27942 | 48124 | 734 |  |  |
| 35  | 0.48615                  | 77544 | 72669 | 65149 | 76445 | 53042 | 903 |  |  |
| 36  | 0.48653                  | 06881 | 02627 | 50607 | 98800 | 62019 | 092 |  |  |
| 37  | 0.48688                  | 40517 | 09199 | 25908 | 75404 | 84983 | 569 |  |  |
| 38  | 0.48721                  | 93465 | 18502 | 66015 | 76696 | 81878 | 149 |  |  |
| 39  | 0.48753                  | 79240 | 20610 | 16277 | 25298 | 04543 | 616 |  |  |
| 40  | 0.48784                  | 10041 | 86339 | 58380 | 85142 | 17067 | 797 |  |  |
| 41  | 0.48812                  | 96910 | 87420 | 96527 | 10222 | 00577 | 180 |  |  |
| 42  | 0.48840                  | 49863 | 41878 | 18477 | 23324 | 32927 | 643 |  |  |
| 43  | 0.48866                  | 78007 | 29911 | 21582 | 34335 | 10307 | 875 |  |  |
| 44  | 0.48891                  | 89642 | 64296 | 12993 | 32097 | 95414 | 684 |  |  |
| 45  | 0.48915                  | 92349 | 50017 | 70447 | 06168 | 21886 | 427 |  |  |
| 46  | 0.48938                  | 93064 | 27971 | 83932 | 49874 | 31926 | 913 |  |  |
| 47  | 0.48960                  | 98146 | 65161 | 56787 | 58628 | 00582 | 357 |  |  |
| 48  | 0.48982                  | 13438 | 27340 | 37679 | 20732 | 35703 | 289 |  |  |
| 49  | 0.49002                  | 44314 | 48343 | 03446 | 74056 | 99209 | 492 |  |  |
| 50  | 0.49021                  | 95729 | 92455 | 97875 | 58026 | 00478 | 129 |  |  |
| 51  | 0.49040                  | 72258 | 91382 | 03523 | 82899 | 45912 | 914 |  |  |
| 52  | 0.49058                  | 78131 | 25065 | 55214 | 68968 | 71609 | 940 |  |  |
| 53  | 0.49076                  | 17264 | 05400 | 11136 | 70388 | 20238 | 972 |  |  |
| 54  | 0.49092                  | 93290 | 13270 | 60377 | 57892 | 02336 | 390 |  |  |
| 55  | 0.49109                  | 09583 | 32186 | 24858 | 13994 | 32065 | 710 |  |  |
| 56  | 0.49124                  | 69281 | 15700 | 19946 | 70135 | 96737 | 505 |  |  |
| 57  | 0.49139                  | 75305 | 20689 | 44546 | 38708 | 92420 | 648 |  |  |
| 58  | 0.49154                  | 30379 | 34226 | 86647 | 94221 | 18373 | 214 |  |  |
| 59  | 0.49168                  | 37046 | 18085 | 72057 | 23591 | 06860 | 171 |  |  |
| 60  | 0.49181                  | 97681 | 91769 | 07838 | 44404 | 20173 | 562 |  |  |
| 61  | 0.49195                  | 14509 | 72265 | 19454 | 82087 | 07682 | 047 |  |  |
| 62  | 0.49207                  | 89611 | 86422 | 20282 | 34064 | 97036 | 355 |  |  |
| 63  | 0.49220                  | 24940 | 69851 | 93943 | 75036 | 02926 | 046 |  |  |
| 64  | 0.49232                  | 22328 | 64563 | 35927 | 70818 | 59899 | 974 |  |  |
| 65  | 0.49243                  | 83497 | 26049 | 41901 | 44856 | 98128 | 325 |  |  |
| 66  | 0.49255                  | 10065 | 49272 | 76993 | 20455 | 32162 | 329 |  |  |
| 67  | 0.49266                  | 03557 | 21886 | 04523 | 14733 | 55300 | 786 |  |  |
| 68  | 0.49276                  | 65408 | 12057 | 48683 | 49004 | 79145 | 911 |  |  |
| 69  | 0.49286                  | 96971 | 97431 | 51784 | 24471 | 26155 | 638 |  |  |
| 70  | 0.49296                  | 99526 | 41019 | 20170 | 91141 | 41040 | 111 |  |  |

**Table 3**  
 $\Pi_{s-\frac{1}{2}}(s)$  to 33 Decimal Places for  $s = 1(1)71$

| $s$ | $\Pi_{s-\frac{1}{2}}(s)$ |       |       |       |       |       |     |  |  |
|-----|--------------------------|-------|-------|-------|-------|-------|-----|--|--|
| 1   | 0.46439                  | 87801 | 10529 | 21148 | 64127 | 73365 | 386 |  |  |
| 2   | 0.48424                  | 80053 | 44947 | 67937 | 29726 | 32292 | 120 |  |  |
| 3   | 0.49087                  | 30296 | 38979 | 07642 | 45235 | 04173 | 670 |  |  |
| 4   | 0.49398                  | 85363 | 92239 | 01453 | 00994 | 48869 | 239 |  |  |
| 5   | 0.49572                  | 33324 | 48920 | 85537 | 12366 | 64053 | 029 |  |  |
| 6   | 0.49679                  | 47886 | 15819 | 54316 | 36416 | 69197 | 452 |  |  |
| 7   | 0.49750                  | 52270 | 03106 | 99601 | 10046 | 17630 | 344 |  |  |
| 8   | 0.49800                  | 14446 | 31123 | 26927 | 98453 | 34966 | 981 |  |  |
| 9   | 0.49836                  | 21570 | 28137 | 99771 | 19016 | 58746 | 508 |  |  |
| 10  | 0.49863                  | 28138 | 03644 | 73606 | 38642 | 16782 | 570 |  |  |
| 11  | 0.49884                  | 12116 | 85596 | 39534 | 34785 | 40715 | 600 |  |  |
| 12  | 0.49900                  | 51547 | 62134 | 12056 | 88009 | 00788 | 931 |  |  |
| 13  | 0.49913                  | 64882 | 01260 | 58485 | 35601 | 15015 | 965 |  |  |
| 14  | 0.49924                  | 33475 | 37418 | 69430 | 30633 | 95638 | 212 |  |  |
| 15  | 0.49933                  | 14738 | 85750 | 17473 | 27293 | 78808 | 624 |  |  |
| 16  | 0.49940                  | 50143 | 99905 | 11996 | 79833 | 34095 | 384 |  |  |
| 17  | 0.49946                  | 70264 | 32708 | 95306 | 60942 | 03225 | 239 |  |  |
| 18  | 0.49951                  | 98046 | 53157 | 54378 | 24768 | 28927 | 182 |  |  |
| 19  | 0.49956                  | 50988 | 86103 | 09805 | 35132 | 94687 | 984 |  |  |
| 20  | 0.49960                  | 42625 | 53474 | 09387 | 26671 | 79097 | 329 |  |  |
| 21  | 0.49963                  | 83559 | 17424 | 83755 | 25976 | 13246 | 912 |  |  |
| 22  | 0.49966                  | 82192 | 12747 | 77618 | 48705 | 97081 | 329 |  |  |
| 23  | 0.49969                  | 45253 | 43631 | 66507 | 53765 | 30561 | 924 |  |  |
| 24  | 0.49971                  | 78183 | 48884 | 59791 | 01633 | 29832 | 215 |  |  |
| 25  | 0.49973                  | 85419 | 89293 | 30795 | 33044 | 43559 | 185 |  |  |
| 26  | 0.49975                  | 70611 | 45911 | 86682 | 60539 | 39809 | 260 |  |  |
| 27  | 0.49977                  | 36780 | 86444 | 83369 | 48642 | 53883 | 095 |  |  |
| 28  | 0.49978                  | 86449 | 42142 | 47239 | 13359 | 21652 | 735 |  |  |
| 29  | 0.49980                  | 21733 | 74928 | 60369 | 01629 | 14914 | 231 |  |  |
| 30  | 0.49981                  | 44421 | 35914 | 38385 | 13033 | 54434 | 936 |  |  |
| 31  | 0.49982                  | 56030 | 25430 | 27328 | 76949 | 57928 | 664 |  |  |
| 32  | 0.49983                  | 57856 | 29849 | 74294 | 27717 | 86078 | 305 |  |  |
| 33  | 0.49984                  | 51011 | 14126 | 15350 | 94778 | 58322 | 224 |  |  |
| 34  | 0.49985                  | 36452 | 79353 | 15993 | 50795 | 66463 | 580 |  |  |
| 35  | 0.49986                  | 15010 | 43841 | 21458 | 81475 | 15160 | 331 |  |  |
| 36  | 0.49986                  | 87404 | 68740 | 95419 | 10800 | 05413 | 695 |  |  |
| 37  | 0.49987                  | 54264 | 21374 | 14827 | 17133 | 55760 | 191 |  |  |
| 38  | 0.49988                  | 16139 | 48519 | 17773 | 86187 | 85750 | 367 |  |  |
| 39  | 0.49988                  | 73514 | 16076 | 38255 | 44685 | 45587 | 909 |  |  |
| 40  | 0.49989                  | 26814 | 59477 | 08005 | 54745 | 26657 | 031 |  |  |
| 41  | 0.49989                  | 76417 | 79938 | 04782 | 66204 | 99936 | 764 |  |  |
| 42  | 0.49990                  | 22658 | 14501 | 95110 | 85926 | 54575 | 350 |  |  |
| 43  | 0.49990                  | 65833 | 02230 | 89509 | 59557 | 60289 | 741 |  |  |
| 44  | 0.49991                  | 60207 | 64555 | 90068 | 81062 | 17720 | 239 |  |  |
| 45  | 0.49991                  | 44019 | 14347 | 20620 | 83706 | 91205 | 705 |  |  |
| 46  | 0.49991                  | 79480 | 05546 | 96417 | 02895 | 40774 | 335 |  |  |
| 47  | 0.49992                  | 12781 | 33037 | 03021 | 35346 | 76217 | 715 |  |  |
| 48  | 0.49992                  | 44094 | 90678 | 39344 | 55475 | 82458 | 186 |  |  |
| 49  | 0.49992                  | 73575 | 94062 | 23303 | 21789 | 80446 | 404 |  |  |
| 50  | 0.49993                  | 01364 | 73383 | 92147 | 51037 | 24950 | 528 |  |  |
| 51  | 0.49993                  | 27588 | 40935 | 04846 | 11209 | 25139 |     |  |  |

**Table 4**  
 $\Pi_{s+\frac{1}{2}}(s-\frac{1}{2})$  to 33 Decimal Places for  $s = 1(1)70$

| <b>s</b> | $\Pi_{s+\frac{1}{2}}(s-\frac{1}{2})$ |       |       |       |       |       |     |  |  |
|----------|--------------------------------------|-------|-------|-------|-------|-------|-----|--|--|
| 1        | 0.10774                              | 57644 | 38628 | 87367 | 36082 | 44177 | 514 |  |  |
| 2        | 0.24322                              | 51625 | 15757 | 05059 | 82026 | 92281 | 448 |  |  |
| 3        | 0.30936                              | 90228 | 82790 | 94554 | 18380 | 45875 | 232 |  |  |
| 4        | 0.34831                              | 48246 | 49018 | 73101 | 32202 | 20058 | 045 |  |  |
| 5        | 0.37399                              | 28629 | 89273 | 53744 | 36459 | 82377 | 857 |  |  |
| 6        | 0.39220                              | 84348 | 03846 | 10913 | 88935 | 44863 | 843 |  |  |
| 7        | 0.40580                              | 81098 | 17206 | 21862 | 49878 | 34524 | 635 |  |  |
| 8        | 0.41636                              | 23183 | 15238 | 88033 | 33275 | 24903 | 437 |  |  |
| 9        | 0.42476                              | 85160 | 11057 | 70994 | 13242 | 44573 | 794 |  |  |
| 10       | 0.43164                              | 28404 | 28206 | 01547 | 33382 | 00689 | 159 |  |  |
| 11       | 0.43736                              | 40340 | 89911 | 40164 | 77519 | 75813 | 080 |  |  |
| 12       | 0.44220                              | 01509 | 53753 | 70166 | 95576 | 44448 | 657 |  |  |
| 13       | 0.44634                              | 20687 | 73310 | 76821 | 13093 | 87240 | 670 |  |  |
| 14       | 0.44992                              | 93760 | 72970 | 48027 | 53354 | 41207 | 922 |  |  |
| 15       | 0.45306                              | 66032 | 12299 | 63840 | 16606 | 92377 | 029 |  |  |
| 16       | 0.45583                              | 36180 | 02506 | 87743 | 87820 | 94983 | 515 |  |  |
| 17       | 0.45829                              | 20829 | 91043 | 80560 | 81240 | 76365 | 511 |  |  |
| 18       | 0.46049                              | 11583 | 12614 | 63658 | 29030 | 31573 | 883 |  |  |
| 19       | 0.46246                              | 97929 | 11366 | 77112 | 66265 | 12534 | 579 |  |  |
| 20       | 0.46425                              | 95706 | 93333 | 92037 | 40566 | 60012 | 551 |  |  |
| 21       | 0.46688                              | 63138 | 75697 | 38493 | 45830 | 19396 | 485 |  |  |
| 22       | 0.46737                              | 13401 | 04616 | 96321 | 82030 | 41707 | 220 |  |  |
| 23       | 0.46873                              | 24040 | 67497 | 07743 | 05749 | 05869 | 881 |  |  |
| 24       | 0.46998                              | 44123 | 02688 | 90789 | 74381 | 97618 | 639 |  |  |
| 25       | 0.47113                              | 99725 | 00820 | 24680 | 02687 | 52344 | 896 |  |  |
| 26       | 0.47220                              | 98203 | 59052 | 63741 | 71874 | 00540 | 037 |  |  |
| 27       | 0.47320                              | 31547 | 01015 | 40597 | 28675 | 87469 | 187 |  |  |
| 28       | 0.47412                              | 79030 | 73480 | 89766 | 81474 | 18937 | 819 |  |  |
| 29       | 0.47499                              | 09340 | 88754 | 80327 | 66992 | 70378 | 157 |  |  |
| 30       | 0.47579                              | 82285 | 70566 | 70903 | 19928 | 79939 | 186 |  |  |
| 31       | 0.47655                              | 50185 | 38189 | 61001 | 37942 | 43515 | 780 |  |  |
| 32       | 0.47726                              | 59008 | 67383 | 04096 | 06351 | 70991 | 933 |  |  |
| 33       | 0.47793                              | 49308 | 53583 | 32301 | 28519 | 13769 | 985 |  |  |
| 34       | 0.47856                              | 56997 | 05511 | 22408 | 90106 | 04726 | 614 |  |  |
| 35       | 0.47916                              | 13991 | 00181 | 04776 | 43048 | 01593 | 123 |  |  |
| 36       | 0.47972                              | 48752 | 51864 | 61562 | 14318 | 05053 | 575 |  |  |
| 37       | 0.48025                              | 86744 | 30178 | 49167 | 72007 | 54996 | 082 |  |  |
| 38       | 0.48076                              | 50814 | 64731 | 83030 | 32235 | 04444 | 640 |  |  |
| 39       | 0.48124                              | 61524 | 65714 | 54710 | 78996 | 56428 | 682 |  |  |
| 40       | 0.48170                              | 37427 | 49502 | 64685 | 88718 | 23881 | 552 |  |  |
| 41       | 0.48213                              | 95307 | 69644 | 35166 | 20425 | 50335 | 053 |  |  |
| 42       | 0.48255                              | 50387 | 04446 | 07835 | 56052 | 37886 | 143 |  |  |
| 43       | 0.48295                              | 16502 | 33791 | 62253 | 20277 | 38679 | 000 |  |  |
| 44       | 0.48333                              | 06259 | 42998 | 08396 | 62318 | 34489 | 246 |  |  |
| 45       | 0.48369                              | 31167 | 15264 | 93029 | 84131 | 38752 | 885 |  |  |
| 46       | 0.48404                              | 01754 | 12647 | 87166 | 63584 | 29834 | 344 |  |  |
| 47       | 0.48437                              | 27670 | 95435 | 75977 | 38260 | 96667 | 703 |  |  |
| 48       | 0.48469                              | 17779 | 88961 | 46463 | 46395 | 01561 | 213 |  |  |
| 49       | 0.48499                              | 80233 | 73392 | 69552 | 00375 | 68955 | 001 |  |  |
| 50       | 0.48529                              | 22545 | 44480 | 41090 | 91954 | 31373 | 090 |  |  |
| 51       | 0.48557                              | 51649 | 70451 | 44846 | 45101 | 57526 | 790 |  |  |
| 52       | 0.48584                              | 73957 | 51315 | 74855 | 27241 | 82010 | 362 |  |  |
| 53       | 0.48610                              | 95404 | 71098 | 59618 | 54678 | 83115 | 679 |  |  |
| 54       | 0.48636                              | 21495 | 20330 | 09785 | 59939 | 44464 | 925 |  |  |
| 55       | 0.48660                              | 57339 | 55066 | 07824 | 28985 | 45065 | 461 |  |  |
| 56       | 0.48684                              | 07689 | 49404 | 34683 | 47717 | 62504 | 066 |  |  |
| 57       | 0.48706                              | 76968 | 90596 | 17359 | 79530 | 29621 | 471 |  |  |
| 58       | 0.48728                              | 69301 | 59189 | 46187 | 17428 | 18805 | 452 |  |  |
| 59       | 0.48749                              | 88536 | 30977 | 18509 | 97951 | 79553 | 519 |  |  |
| 60       | 0.48770                              | 38269 | 32697 | 99519 | 49007 | 30863 | 827 |  |  |
| 61       | 0.48790                              | 21864 | 79310 | 50434 | 68008 | 89492 | 924 |  |  |
| 62       | 0.48809                              | 42473 | 17127 | 17592 | 49280 | 20601 | 531 |  |  |
| 63       | 0.48828                              | 03047 | 94055 | 78864 | 19403 | 38693 | 298 |  |  |
| 64       | 0.48846                              | 06360 | 75579 | 44169 | 75256 | 12707 | 723 |  |  |
| 65       | 0.48863                              | 55015 | 22846 | 20927 | 44027 | 09771 | 810 |  |  |
| 66       | 0.48880                              | 51459 | 47283 | 48278 | 83818 | 35552 | 469 |  |  |
| 67       | 0.48896                              | 97997 | 54455 | 04824 | 60023 | 15484 | 300 |  |  |
| 68       | 0.48912                              | 96799 | 88403 | 45724 | 26921 | 08636 | 793 |  |  |
| 69       | 0.48928                              | 49912 | 86434 | 59659 | 41808 | 67765 | 001 |  |  |
| 70       | 0.48943                              | 59267 | 53178 | 78644 | 13929 | 73556 | 330 |  |  |

B L A N K   P A G E

## APPENDIX C

VALUES OF  $\Omega_{s+\frac{1}{2}}(s)$ ,  $\Omega_{s-\frac{1}{2}}(s)$ ,  $\Omega_{s+\frac{1}{2}}(s-\frac{1}{2})$ , AND  $\Omega_{s-\frac{1}{2}}(s-\frac{1}{2})$

**Table 5**  
 $\Omega_{s+\frac{1}{2}}(s)$  to 33 Decimal Places for  $s = 1(1)70$

| $s$ | $\Omega_{s+\frac{1}{2}}(s)$ |       |       |       |       |       |     |  |  |  |
|-----|-----------------------------|-------|-------|-------|-------|-------|-----|--|--|--|
| 1   | 0.35706                     | 74799 | 26313 | 85900 | 90581 | 51089 | 743 |  |  |  |
| 2   | 0.41260                     | 15957 | 24041 | 85650 | 16218 | 94166 | 305 |  |  |  |
| 3   | 0.43639                     | 45460 | 23732 | 22020 | 75512 | 82136 | 854 |  |  |  |
| 4   | 0.44978                     | 79676 | 51343 | 09819 | 54671 | 56560 | 676 |  |  |  |
| 5   | 0.45843                     | 33341 | 37344 | 67693 | 52393 | 96315 | 428 |  |  |  |
| 6   | 0.46449                     | 71182 | 00781 | 96015 | 66384 | 59202 | 352 |  |  |  |
| 7   | 0.46899                     | 51214 | 63766 | 80372 | 30623 | 56878 | 346 |  |  |  |
| 8   | 0.47246                     | 92285 | 82472 | 21714 | 83808 | 61207 | 547 |  |  |  |
| 9   | 0.47523                     | 58512 | 36500 | 84427 | 29352 | 70661 | 203 |  |  |  |
| 10  | 0.47749                     | 25582 | 82243 | 10851 | 06055 | 07826 | 124 |  |  |  |
| 11  | 0.47936                     | 92757 | 78994 | 75228 | 01509 | 61054 | 644 |  |  |  |
| 12  | 0.48095                     | 50514 | 28351 | 24425 | 39511 | 35242 | 626 |  |  |  |
| 13  | 0.48231                     | 30113 | 61749 | 06643 | 73124 | 81836 | 478 |  |  |  |
| 14  | 0.48348                     | 91816 | 88009 | 53653 | 49732 | 73176 | 898 |  |  |  |
| 15  | 0.48451                     | 79284 | 97661 | 12122 | 63909 | 23733 | 590 |  |  |  |
| 16  | 0.48542                     | 54405 | 81910 | 18669 | 77131 | 30574 | 173 |  |  |  |
| 17  | 0.48623                     | 20314 | 65368 | 44559 | 29370 | 59724 | 053 |  |  |  |
| 18  | 0.48695                     | 37035 | 80711 | 57902 | 24549 | 77260 | 039 |  |  |  |
| 19  | 0.48760                     | 32369 | 82771 | 34035 | 81152 | 51329 | 656 |  |  |  |
| 20  | 0.48819                     | 09633 | 62464 | 29866 | 08125 | 08197 | 728 |  |  |  |
| 21  | 0.48872                     | 53267 | 78329 | 22843 | 69976 | 80084 | 411 |  |  |  |
| 22  | 0.48921                     | 32967 | 65357 | 72995 | 25709 | 71742 | 700 |  |  |  |
| 23  | 0.48966                     | 06773 | 23254 | 11503 | 26102 | 04130 | 883 |  |  |  |
| 24  | 0.49007                     | 23412 | 09255 | 90408 | 80032 | 68735 | 789 |  |  |  |
| 25  | 0.49045                     | 24098 | 14418 | 32553 | 59760 | 35726 | 290 |  |  |  |
| 26  | 0.49080                     | 43928 | 37973 | 26273 | 67017 | 94904 | 122 |  |  |  |
| 27  | 0.49113                     | 12978 | 78763 | 25419 | 04969 | 14369 | 325 |  |  |  |
| 28  | 0.49143                     | 57172 | 49824 | 93940 | 50033 | 05042 | 927 |  |  |  |
| 29  | 0.49171                     | 98973 | 60239 | 67772 | 83144 | 22626 | 688 |  |  |  |
| 30  | 0.49198                     | 57946 | 20412 | 08145 | 77344 | 05473 | 834 |  |  |  |
| 31  | 0.49223                     | 51208 | 32116 | 23898 | 67128 | 98546 | 395 |  |  |  |
| 32  | 0.49246                     | 93803 | 02917 | 17617 | 94247 | 02938 | 284 |  |  |  |
| 33  | 0.49268                     | 99003 | 95039 | 90848 | 32009 | 15682 | 586 |  |  |  |
| 34  | 0.49289                     | 78568 | 26144 | 71194 | 80375 | 28702 | 559 |  |  |  |
| 35  | 0.49309                     | 42947 | 45508 | 66167 | 36573 | 79419 | 392 |  |  |  |
| 36  | 0.49328                     | 01463 | 86995 | 22326 | 35923 | 23427 | 589 |  |  |  |
| 37  | 0.49345                     | 62459 | 30910 | 84037 | 19094 | 88983 | 278 |  |  |  |
| 38  | 0.49362                     | 33420 | 76786 | 26612 | 81165 | 23155 | 482 |  |  |  |
| 39  | 0.49378                     | 21087 | 28430 | 91342 | 72335 | 87900 | 546 |  |  |  |
| 40  | 0.49393                     | 31541 | 14096 | 71105 | 63214 | 55153 | 550 |  |  |  |
| 41  | 0.49407                     | 70286 | 02952 | 77202 | 67122 | 77170 | 907 |  |  |  |
| 42  | 0.49421                     | 42314 | 30374 | 54243 | 38613 | 76654 | 949 |  |  |  |
| 43  | 0.49434                     | 52165 | 05840 | 72438 | 79058 | 00173 | 359 |  |  |  |
| 44  | 0.49447                     | 03974 | 46281 | 80605 | 11983 | 46523 | 809 |  |  |  |
| 45  | 0.49459                     | 01519 | 52843 | 42243 | 12817 | 33972 | 380 |  |  |  |
| 46  | 0.49470                     | 48256 | 28921 | 28275 | 62727 | 12352 | 271 |  |  |  |
| 47  | 0.49481                     | 47353 | 20994 | 93852 | 55551 | 62479 | 314 |  |  |  |
| 48  | 0.49492                     | 01720 | 50462 | 62091 | 98704 | 33855 | 816 |  |  |  |
| 49  | 0.49502                     | 14035 | 93756 | 57740 | 24894 | 94103 | 560 |  |  |  |
| 50  | 0.49511                     | 86767 | 59025 | 82032 | 16794 | 80247 | 002 |  |  |  |
| 51  | 0.49521                     | 22194 | 00239 | 07822 | 29676 | 27532 | 145 |  |  |  |
| 52  | 0.49530                     | 22422 | 03390 | 47952 | 04278 | 44427 | 559 |  |  |  |
| 53  | 0.49538                     | 89402 | 74349 | 68581 | 04041 | 77273 | 861 |  |  |  |
| 54  | 0.49547                     | 24945 | 53599 | 38829 | 61990 | 73815 | 874 |  |  |  |
| 55  | 0.49555                     | 30730 | 79495 | 72963 | 63700 | 62645 | 891 |  |  |  |
| 56  | 0.49563                     | 08321 | 18649 | 86193 | 92157 | 91598 | 920 |  |  |  |
| 57  | 0.49570                     | 59171 | 79463 | 11616 | 12654 | 64301 | 300 |  |  |  |
| 58  | 0.49577                     | 84639 | 22674 | 12423 | 57247 | 74140 | 060 |  |  |  |
| 59  | 0.49584                     | 85989 | 80928 | 37698 | 69533 | 05255 | 013 |  |  |  |
| 60  | 0.49591                     | 64406 | 97805 | 58686 | 73411 | 32659 | 783 |  |  |  |
| 61  | 0.49598                     | 20997 | 95393 | 83157 | 79612 | 86211 | 544 |  |  |  |
| 62  | 0.49604                     | 56799 | 78345 | 45405 | 91520 | 47023 | 136 |  |  |  |
| 63  | 0.49610                     | 72784 | 81358 | 00744 | 59187 | 40780 | 200 |  |  |  |
| 64  | 0.49616                     | 69865 | 66169 | 17633 | 95921 | 87050 | 774 |  |  |  |
| 65  | 0.49622                     | 48899 | 73416 | 76143 | 19808 | 79055 | 233 |  |  |  |
| 66  | 0.49628                     | 10693 | 34076 | 08655 | 18361 | 58853 | 301 |  |  |  |
| 67  | 0.49633                     | 56005 | 44632 | 99499 | 90621 | 17989 | 828 |  |  |  |
| 68  | 0.49638                     | 85551 | 09668 | 69081 | 25598 | 83840 | 265 |  |  |  |
| 69  | 0.49644                     | 00004 | 55112 | 72237 | 05012 | 13710 | 798 |  |  |  |
| 70  | 0.49649                     | 00002 | 15053 | 67329 | 76538 | 53850 | 589 |  |  |  |

**Table 6**  
 $\Omega_{s-\frac{1}{2}}(s)$  to 33 Decimal Places for  $s = 1(1)71$

| $s$ | $\Omega_{s-\frac{1}{2}}(s)$ |       |       |       |       |       |       |  |  |  |
|-----|-----------------------------|-------|-------|-------|-------|-------|-------|--|--|--|
| 1   | 0.38094                     | 90365 | 05182 | 31125 | 84084 | 80584 | 405   |  |  |  |
| 2   | 0.42087                     | 15664 | 01657 | 91315 | 48831 | 90740 | 935   |  |  |  |
| 3   | 0.44028                     | 85258 | 71415 | 95895 | 50423 | 33651 | 027   |  |  |  |
| 4   | 0.45194                     | 66457 | 35447 | 22071 | 38133 | 11063 | 616   |  |  |  |
| 5   | 0.45975                     | 96689 | 19334 | 85525 | 44196 | 29989 | 497   |  |  |  |
| 6   | 0.46537                     | 22725 | 25789 | 29383 | 31851 | 26420 | 072   |  |  |  |
| 7   | 0.46960                     | 37438 | 57229 | 11502 | 55752 | 09167 | 216   |  |  |  |
| 8   | 0.47290                     | 99769 | 72621 | 81602 | 47079 | 65587 | 118   |  |  |  |
| 9   | 0.47556                     | 54699 | 96385 | 20403 | 59274 | 86886 | 700   |  |  |  |
| 10  | 0.47774                     | 56212 | 09021 | 92139 | 77556 | 88457 | 465   |  |  |  |
| 11  | 0.47956                     | 78493 | 96015 | 59019 | 88032 | 91471 | 999   |  |  |  |
| 12  | 0.48111                     | 37687 | 75968 | 36957 | 15191 | 24946 | 706   |  |  |  |
| 13  | 0.48244                     | 18926 | 66516 | 60407 | 22432 | 34376 | 166   |  |  |  |
| 14  | 0.48359                     | 52787 | 16618 | 02183 | 07341 | 12019 | 849   |  |  |  |
| 15  | 0.48460                     | 63224 | 30966 | 09021 | 04564 | 67647 | 222   |  |  |  |
| 16  | 0.48549                     | 98687 | 85039 | 93164 | 92992 | 50489 | 894   |  |  |  |
| 17  | 0.48629                     | 52931 | 02886 | 10874 | 03385 | 02572 | 528   |  |  |  |
| 18  | 0.48700                     | 79290 | 74069 | 02121 | 89607 | 46565 | 690   |  |  |  |
| 19  | 0.48765                     | 00712 | 07156 | 86338 | 44724 | 56849 | 820   |  |  |  |
| 20  | 0.48823                     | 16927 | 91874 | 03352 | 14697 | 95326 | 101   |  |  |  |
| 21  | 0.48876                     | 09693 | 75279 | 16178 | 49424 | 34872 | 527   |  |  |  |
| 22  | 0.48911                     | 46666 | 00258 | 93766 | 66296 | 82391 | 012   |  |  |  |
| 23  | 0.48963                     | 84317 | 35399 | 21648 | 09377 | 65449 | 251   |  |  |  |
| 24  | 0.49009                     | 70157 | 07015 | 03706 | 77614 | 90349 | 45135 |  |  |  |
| 25  | 0.49047                     | 44442 | 11657 | 34966 | 10591 | 35224 | 742   |  |  |  |
| 26  | 0.49082                     | 41510 | 97160 | 11895 | 31759 | 23936 | 260   |  |  |  |
| 27  | 0.49114                     | 90832 | 86459 | 50990 | 72524 | 81167 | 680   |  |  |  |
| 28  | 0.49145                     | 17841 | 73211 | 98027 | 19537 | 92499 | 992   |  |  |  |
| 29  | 0.49173                     | 44604 | 25615 | 17744 | 06002 | 16384 | 265   |  |  |  |
| 30  | 0.49199                     | 90359 | 42358 | 82016 | 29630 | 01629 | 384   |  |  |  |
| 31  | 0.49224                     | 71957 | 52793 | 37482 | 39202 | 02959 | 974   |  |  |  |
| 32  | 0.49248                     | 04219 | 82525 | 94197 | 50253 | 28716 | 825   |  |  |  |
| 33  | 0.49270                     | 00235 | 09089 | 39551 | 76358 | 71382 | 057   |  |  |  |
| 34  | 0.49290                     | 71605 | 62858 | 21645 | 50412 | 22361 | 863   |  |  |  |
| 35  | 0.49310                     | 28652 | 50850 | 64651 | 90394 | 75229 | 230   |  |  |  |
| 36  | 0.49328                     | 80587 | 70719 | 55477 | 54339 | 51769 | 357   |  |  |  |
| 37  | 0.49346                     | 36569 | 21485 | 73556 | 16964 | 37483 | 347   |  |  |  |
| 38  | 0.49363                     | 01273 | 93746 | 11621 | 23758 | 61902 | 861   |  |  |  |
| 39  | 0.49378                     | 84102 | 26002 | 60075 | 67930 | 07165 | 970   |  |  |  |
| 40  | 0.49393                     | 90167 | 38668 | 82860 | 61206 | 44781 | 144   |  |  |  |
| 41  | 0.49408                     | 24921 | 98243 | 17216 | 45712 | 51803 | 731   |  |  |  |
| 42  | 0.49421                     | 93314 | 17376 | 73459 | 10506 | 76176 | 781   |  |  |  |
| 43  | 0.49434                     | 99844 | 59328 | 78810 | 04501 | 79032 | 385   |  |  |  |
| 44  | 0.49447                     | 48615 | 85481 | 31322 | 79053 | 61271 | 669   |  |  |  |
| 45  | 0.49459                     | 43375 | 60573 | 45674 | 25125 | 64351 | 832   |  |  |  |
| 46  | 0.49470                     | 87554 | 10884 | 57670 | 89546 | 86621 | 771   |  |  |  |
| 47  | 0                           |       |       |       |       |       |       |  |  |  |

Table 7  
 $\Omega_{s+\frac{1}{2}}(s-\frac{1}{2})$  to 33 Decimal Places for  $s = 1(1)70$

| $s$ | $\Omega_{s+\frac{1}{2}}(s-\frac{1}{2})$ |       |       |       |       |       |     |  |  |  |
|-----|---|-------|-------|-------|-------|-------|-----|--|--|--|
| 1   | 0.24392                                 | 23488 | 71790 | 51540 | 71859 | 45988 | 980 |  |  |  |
| 2   | 0.37138                                 | 03365 | 91535 | 18854 | 89218 | 37340 | 105 |  |  |  |
| 3   | 0.41474                                 | 20232 | 48063 | 40592 | 53097 | 96152 | 739 |  |  |  |
| 4   | 0.43637                                 | 75186 | 27196 | 12860 | 63380 | 23145 | 432 |  |  |  |
| 5   | 0.44929                                 | 15433 | 13196 | 00627 | 92476 | 42788 | 078 |  |  |  |
| 6   | 0.45785                                 | 82282 | 15869 | 26273 | 56881 | 33936 | 398 |  |  |  |
| 7   | 0.46395                                 | 17601 | 67391 | 07167 | 32804 | 49924 | 146 |  |  |  |
| 8   | 0.46850                                 | 63528 | 91987 | 69945 | 97220 | 43522 | 058 |  |  |  |
| 9   | 0.47203                                 | 90163 | 04972 | 25225 | 38015 | 05352 | 807 |  |  |  |
| 10  | 0.47485                                 | 87672 | 01491 | 61866 | 60531 | 37422 | 919 |  |  |  |
| 11  | 0.47716                                 | 15516 | 41086 | 24720 | 38422 | 98913 | 848 |  |  |  |
| 12  | 0.47907                                 | 75808 | 02990 | 32725 | 28224 | 54639 | 486 |  |  |  |
| 13  | 0.48069                                 | 87435 | 74966 | 36738 | 64515 | 67556 | 343 |  |  |  |
| 14  | 0.48208                                 | 30843 | 16534 | 03643 | 72189 | 25729 | 208 |  |  |  |
| 15  | 0.48328                                 | 34643 | 08572 | 83194 | 01386 | 91684 | 050 |  |  |  |
| 16  | 0.48433                                 | 29603 | 82061 | 49758 | 98784 | 89913 | 958 |  |  |  |
| 17  | 0.48525                                 | 83492 | 99305 | 56353 | 89676 | 84688 | 271 |  |  |  |
| 18  | 0.48608                                 | 04252 | 55366 | 83431 | 93452 | 99632 | 353 |  |  |  |
| 19  | 0.48681                                 | 55821 | 44125 | 39366 | 60361 | 51308 | 429 |  |  |  |
| 20  | 0.48747                                 | 69189 | 75470 | 86435 | 31093 | 48149 | 170 |  |  |  |
| 21  | 0.48807                                 | 50280 | 44774 | 86838 | 88197 | 05145 | 916 |  |  |  |
| 22  | 0.48861                                 | 85672 | 07902 | 36780 | 30096 | 83719 | 674 |  |  |  |
| 23  | 0.48911                                 | 46822 | 32712 | 29503 | 79777 | 37943 | 741 |  |  |  |
| 24  | 0.48956                                 | 93231 | 27341 | 33179 | 70914 | 92593 | 261 |  |  |  |
| 25  | 0.48998                                 | 74842 | 46524 | 25414 | 39504 | 68223 | 419 |  |  |  |
| 26  | 0.49037                                 | 33887 | 74725 | 88033 | 96321 | 11532 | 197 |  |  |  |
| 27  | 0.49073                                 | 06320 | 59979 | 93872 | 57284 | 76117 | 514 |  |  |  |
| 28  | 0.49106                                 | 22941 | 22600 | 37467 | 60453 | 15248 | 196 |  |  |  |
| 29  | 0.49137                                 | 10288 | 05214 | 28157 | 63289 | 73678 | 863 |  |  |  |
| 30  | 0.49165                                 | 91350 | 32899 | 86404 | 71409 | 30992 | 145 |  |  |  |
| 31  | 0.49192                                 | 86142 | 36335 | 75359 | 86387 | 81408 | 339 |  |  |  |
| 32  | 0.49218                                 | 12169 | 74434 | 60846 | 89530 | 40557 | 081 |  |  |  |
| 33  | 0.49241                                 | 84810 | 54548 | 21958 | 42792 | 19280 | 206 |  |  |  |
| 34  | 0.49264                                 | 17629 | 05979 | 83651 | 89687 | 18552 | 885 |  |  |  |
| 35  | 0.49285                                 | 22635 | 60054 | 11493 | 56274 | 89175 | 317 |  |  |  |
| 36  | 0.49305                                 | 10502 | 88416 | 36874 | 33787 | 21451 | 061 |  |  |  |
| 37  | 0.49323                                 | 90747 | 23214 | 28612 | 49818 | 59572 | 692 |  |  |  |
| 38  | 0.49341                                 | 71881 | 08947 | 22902 | 72338 | 64546 | 008 |  |  |  |
| 39  | 0.49358                                 | 61542 | 02129 | 55010 | 30804 | 08513 | 031 |  |  |  |
| 40  | 0.49374                                 | 66602 | 31421 | 87094 | 30414 | 07301 | 466 |  |  |  |
| 41  | 0.49389                                 | 93262 | 50166 | 75949 | 86759 | 55159 | 918 |  |  |  |
| 42  | 0.49404                                 | 47131 | 49886 | 76957 | 67885 | 76461 | 657 |  |  |  |
| 43  | 0.49418                                 | 33295 | 53221 | 32537 | 38468 | 13686 | 828 |  |  |  |
| 44  | 0.49431                                 | 56377 | 64965 | 29267 | 03169 | 28695 | 517 |  |  |  |
| 45  | 0.49444                                 | 20589 | 28039 | 28271 | 21522 | 15235 | 066 |  |  |  |
| 46  | 0.49456                                 | 29775 | 05630 | 91499 | 98382 | 86086 | 558 |  |  |  |
| 47  | 0.49467                                 | 87451 | 90066 | 42020 | 21030 | 01390 | 083 |  |  |  |
| 48  | 0.49478                                 | 96843 | 22177 | 77480 | 66026 | 02502 | 433 |  |  |  |
| 49  | 0.49489                                 | 60908 | 91227 | 36755 | 39563 | 06516 | 712 |  |  |  |
| 50  | 0.49499                                 | 82371 | 74220 | 53472 | 28873 | 41532 | 209 |  |  |  |
| 51  | 0.49509                                 | 63740 | 64190 | 58048 | 46963 | 22118 | 425 |  |  |  |
| 52  | 0.49519                                 | 07331 | 29398 | 45832 | 76122 | 03166 | 743 |  |  |  |
| 53  | 0.49528                                 | 15284 | 39047 | 04381 | 07262 | 24998 | 865 |  |  |  |
| 54  | 0.49536                                 | 89581 | 85826 | 64928 | 36986 | 31760 | 341 |  |  |  |
| 55  | 0.49545                                 | 32061 | 31191 | 22533 | 26525 | 37757 | 062 |  |  |  |
| 56  | 0.49553                                 | 44428 | 95558 | 62825 | 12439 | 17292 | 394 |  |  |  |
| 57  | 0.49561                                 | 28271 | 12508 | 42755 | 35784 | 44534 | 617 |  |  |  |
| 58  | 0.49568                                 | 85064 | 63415 | 74703 | 60543 | 66468 | 798 |  |  |  |
| 59  | 0.49576                                 | 16186 | 06727 | 24865 | 73986 | 42151 | 544 |  |  |  |
| 60  | 0.49583                                 | 22920 | 14188 | 37106 | 10981 | 65534 | 919 |  |  |  |
| 61  | 0.49590                                 | 06467 | 24714 | 25420 | 44735 | 91557 | 146 |  |  |  |
| 62  | 0.49596                                 | 67950 | 25215 | 13482 | 68576 | 41440 | 577 |  |  |  |
| 63  | 0.49603                                 | 08420 | 66503 | 02010 | 63411 | 71267 | 705 |  |  |  |
| 64  | 0.49609                                 | 28864 | 21389 | 20650 | 85701 | 82425 | 452 |  |  |  |
| 65  | 0.49615                                 | 30205 | 91206 | 01788 | 29561 | 42213 | 114 |  |  |  |
| 66  | 0.49621                                 | 13314 | 66229 | 58967 | 07882 | 92263 | 670 |  |  |  |
| 67  | 0.49626                                 | 79007 | 44825 | 74185 | 94211 | 40128 | 981 |  |  |  |
| 68  | 0.49632                                 | 28053 | 15572 | 97620 | 54200 | 53280 | 577 |  |  |  |
| 69  | 0.49637                                 | 61176 | 06122 | 80982 | 30364 | 28010 | 039 |  |  |  |
| 70  | 0.49642                                 | 79059 | 02127 | 40575 | 58387 | 72562 | 731 |  |  |  |

Table 8  
 $\Omega_{s-\frac{1}{2}}(s-\frac{1}{2})$  to 33 Decimal Places for  $s = 1(1)70$

| $s$ | $\Omega_{s-\frac{1}{2}}(s-\frac{1}{2})$ |       |       |       |       |       |     |  |  |  |
|-----|---|-------|-------|-------|-------|-------|-----|--|--|--|
| 1   | 0.32323                                 | 72933 | 09586 | 62192 | 05247 | 32532 | 542 |  |  |  |
| 2   | 0.40537                                 | 62708 | 08595 | 08433 | 03378 | 20469 | 080 |  |  |  |
| 3   | 0.43311                                 | 66320 | 35907 | 32375 | 85704 | 63945 | 324 |  |  |  |
| 4   | 0.44783                                 | 33459 | 77309 | 79701 | 69974 | 25788 | 915 |  |  |  |
| 5   | 0.45710                                 | 23880 | 98000 | 99020 | 89006 | 45128 | 492 |  |  |  |
| 6   | 0.46351                                 | 90593 | 13754 | 49261 | 86923 | 71202 | 488 |  |  |  |
| 7   | 0.46824                                 | 01267 | 12161 | 02149 | 03475 | 01374 | 579 |  |  |  |
| 8   | 0.47186                                 | 59807 | 57270 | 73104 | 44378 | 61557 | 229 |  |  |  |
| 9   | 0.47474                                 | 12814 | 82946 | 85228 | 73623 | 90994 | 240 |  |  |  |
| 10  | 0.47707                                 | 89288 | 94332 | 96447 | 05316 | 95498 | 544 |  |  |  |
| 11  | 0.47901                                 | 77516 | 22283 | 91609 | 03950 | 21128 | 612 |  |  |  |
| 12  | 0.48065                                 | 23379 | 93210 | 54529 | 29974 | 39618 | 106 |  |  |  |
| 13  | 0.48204                                 | 94234 | 75175 | 63074 | 82141 | 38219 | 924 |  |  |  |
| 14  | 0.48325                                 | 74780 | 04301 | 62696 | 32973 | 25741 | 842 |  |  |  |
| 15  | 0.48431                                 | 25758 | 47630 | 64794 | 66028 | 09092 | 686 |  |  |  |
| 16  | 0.48524                                 | 21320 | 67184 | 74049 | 93486 | 81756 | 645 |  |  |  |
| 17  | 0.48606                                 | 73607 | 48076 | 76352 | 37679 | 59770 | 996 |  |  |  |
| 18  | 0.48680                                 | 49387 | 87621 | 18618 | 76403 | 47663 | 819 |  |  |  |
| 19  | 0.48746                                 | 81600 | 95764 | 97497 | 13090 | 26725 | 637 |  |  |  |
| 20  | 0.48806                                 | 77538 | 05812 | 58295 | 73416 | 16936 | 272 |  |  |  |
| 21  | 0.48861                                 | 24755 | 28170 | 42811 | 21236 | 54488 | 97  |  |  |  |
| 22  | 0.48910                                 | 95419 | 69947 | 98476 | 32357 | 41321 | 509 |  |  |  |
| 23  | 0.48956                                 | 49553 | 59385 | 83642 | 74893 | 46130 | 764 |  |  |  |
| 24  | 0.48998                                 | 37489 | 96420 | 35078 | 66908 | 86879 | 006 |  |  |  |
| 25  | 0.49037                                 | 01754 | 60037 | 39973 | 08919 | 66726 | 320 |  |  |  |
| 26  | 0.49072                                 | 78525 | 29995 | 87810 | 02143 | 57423 | 960 |  |  |  |
| 27  | 0.49105                                 | 98775 | 19921 | 64770 | 76927 | 79449 | 157 |  |  |  |
| 28  | 0.49136                                 | 89177 | 30698 | 38485 | 60800 | 52353 | 740 |  |  |  |
| 29  | 0.49165                                 | 72826 | 53272 | 51567 | 23729 | 28987 | 917 |  |  |  |
| 30  | 0.49192                                 | 69820 | 81433 | 37713 | 47722 | 99598 | 142 |  |  |  |
| 31  | 0.49217                                 | 97732 | 44359 | 76116 | 17874 | 97401 | 543 |  |  |  |
| 32  | 0.49241                                 | 71993 | 07617 | 42321 | 33537 | 47848 | 820 |  |  |  |
| 33  | 0.49264                                 | 6210  | 33693 | 57910 | 55550 | 49578 | 292 |  |  |  |
| 34  | 0.49285                                 | 12429 | 80302 | 60391 | 25631 | 60091 | 588 |  |  |  |
| 35  | 0.49305                                 | 01353 | 05983 | 39897 | 48643 | 61059 | 590 |  |  |  |
| 36  | 0.49323                                 | 82520 | 19522 | 77380 | 79510 | 10829 | 732 |  |  |  |
| 37  | 0.49341                                 | 64463 | 32375 | 16268 | 20555 | 70201 | 454 |  |  |  |
| 38  | 0.49358                                 | 54836 | 37124 | 67911 | 13094 | 64563 | 164 |  |  |  |
| 39  | 0.49374                                 | 60525 | 29759 | 08079 | 90139 | 33219 | 038 |  |  |  |
| 40  | 0.49389                                 | 87742 | 11515 | 37209 | 58052 | 87777 | 287 |  |  |  |
| 41  | 0.49404                                 | 42105 | 41734 | 33565 | 36979 | 21948 | 265 |  |  |  |
| 42  | 0.49418                                 | 28709 | 62384 | 53807 | 50174 | 12293 | 038 |  |  |  |
| 43  | 0.49431                                 | 52184 | 74586 | 71953 | 27813 | 32530 | 271 |  |  |  |
| 44  | 0.49444                                 | 16748 | 15250 | 91348 | 26969 | 34132 | 677 |  |  |  |
| 45  | 0.49456                                 | 26249 | 56057 | 40064 | 21977 | 03669 | 680 |  |  |  |
|     |   |       |       |       |       |       |     |  |  |  |

B L A N K      P A G E

## APPENDIX D

VALUES OF THE FRESNEL INTEGRALS  $S_2(x)$ ,  $C_2(x)$ ,  $S(x)$ , AND  $C(x)$

**Table 9**  
 **$S_2(x)$  to 28 Decimal Places for  $x = 1(1)70$**

| <b>x</b> | <b><math>S_2(x)</math></b> |       |       |       |       |     |  |  |  |  |
|----------|----------------------------|-------|-------|-------|-------|-----|--|--|--|--|
| 1        | 0.24755                    | 82876 | 51610 | 84260 | 99050 | 144 |  |  |  |  |
| 2        | 0.56284                    | 89062 | 30056 | 47929 | 80811 | 091 |  |  |  |  |
| 3        | 0.71168                    | 50216 | 07530 | 03251 | 62245 | 900 |  |  |  |  |
| 4        | 0.64211                    | 87357 | 44514 | 69533 | 18002 | 859 |  |  |  |  |
| 5        | 0.46594                    | 14967 | 66258 | 53239 | 02386 | 006 |  |  |  |  |
| 6        | 0.34985                    | 23653 | 53978 | 11417 | 86162 | 438 |  |  |  |  |
| 7        | 0.38119                    | 44739 | 44967 | 60991 | 63048 | 088 |  |  |  |  |
| 8        | 0.51200                    | 96184 | 67464 | 11649 | 82642 | 631 |  |  |  |  |
| 9        | 0.61721                    | 36970 | 24189 | 61244 | 00929 | 011 |  |  |  |  |
| 10       | 0.60843                    | 62590 | 65110 | 89720 | 19547 | 955 |  |  |  |  |
| 11       | 0.50478                    | 63386 | 47342 | 03809 | 68183 | 456 |  |  |  |  |
| 12       | 0.40581                    | 10077 | 59143 | 22235 | 53644 | 027 |  |  |  |  |
| 13       | 0.39826                    | 77211 | 08448 | 47737 | 84957 | 116 |  |  |  |  |
| 14       | 0.48176                    | 94215 | 59744 | 45667 | 96895 | 665 |  |  |  |  |
| 15       | 0.57580                    | 32698 | 07805 | 48219 | 77229 | 457 |  |  |  |  |
| 16       | 0.59612                    | 66594 | 98017 | 19736 | 48629 | 640 |  |  |  |  |
| 17       | 0.52925                    | 92129 | 08924 | 91400 | 19054 | 543 |  |  |  |  |
| 18       | 0.43998                    | 93396 | 82881 | 69933 | 05126 | 288 |  |  |  |  |
| 19       | 0.40933                    | 64957 | 30567 | 52374 | 19924 | 504 |  |  |  |  |
| 20       | 0.46164                    | 57788 | 15957 | 76010 | 44402 | 616 |  |  |  |  |
| 21       | 0.54588                    | 38021 | 13002 | 40369 | 03426 | 682 |  |  |  |  |
| 22       | 0.58493                    | 89064 | 87810 | 39959 | 25854 | 993 |  |  |  |  |
| 23       | 0.54578                    | 17221 | 88624 | 21912 | 36877 | 295 |  |  |  |  |
| 24       | 0.46702                    | 84356 | 61254 | 99740 | 12891 | 612 |  |  |  |  |
| 25       | 0.42121                    | 70480 | 22836 | 05724 | 64907 | 451 |  |  |  |  |
| 26       | 0.44830                    | 00011 | 91069 | 73629 | 28809 | 124 |  |  |  |  |
| 27       | 0.52105                    | 36692 | 33784 | 59264 | 68564 | 828 |  |  |  |  |
| 28       | 0.57214                    | 20631 | 62520 | 77264 | 59409 | 563 |  |  |  |  |
| 29       | 0.55621                    | 23973 | 19162 | 09274 | 77896 | 506 |  |  |  |  |
| 30       | 0.48996                    | 86291 | 00923 | 19993 | 94160 | 139 |  |  |  |  |
| 31       | 0.43497                    | 25874 | 60339 | 12318 | 21081 | 032 |  |  |  |  |
| 32       | 0.44060                    | 47712 | 22625 | 03026 | 26065 | 462 |  |  |  |  |
| 33       | 0.49987                    | 28381 | 15131 | 66742 | 07038 | 097 |  |  |  |  |
| 34       | 0.55748                    | 94930 | 84749 | 63207 | 44223 | 545 |  |  |  |  |
| 35       | 0.56131                    | 33650 | 04911 | 49641 | 16543 | 190 |  |  |  |  |
| 36       | 0.50941                    | 67298 | 57160 | 52096 | 68003 | 820 |  |  |  |  |
| 37       | 0.45039                    | 59263 | 07966 | 73341 | 50882 | 260 |  |  |  |  |
| 38       | 0.43797                    | 07054 | 62434 | 94397 | 35566 | 333 |  |  |  |  |
| 39       | 0.48218                    | 72763 | 36492 | 42823 | 11962 | 764 |  |  |  |  |
| 40       | 0.54146                    | 35717 | 53990 | 76653 | 46122 | 669 |  |  |  |  |
| 41       | 0.56160                    | 84504 | 15086 | 92834 | 37102 | 012 |  |  |  |  |
| 42       | 0.52528                    | 21742 | 89865 | 59053 | 11247 | 283 |  |  |  |  |
| 43       | 0.46682                    | 88117 | 93015 | 92018 | 95391 | 349 |  |  |  |  |
| 44       | 0.43987                    | 77286 | 99008 | 64373 | 95784 | 992 |  |  |  |  |
| 45       | 0.46820                    | 89680 | 25314 | 90768 | 70354 | 210 |  |  |  |  |
| 46       | 0.52483                    | 65418 | 06007 | 76809 | 09045 | 621 |  |  |  |  |
| 47       | 0.55764                    | 98008 | 25884 | 38939 | 19197 | 444 |  |  |  |  |
| 48       | 0.53730                    | 91333 | 90219 | 36635 | 11992 | 529 |  |  |  |  |
| 49       | 0.48342                    | 78283 | 38064 | 54076 | 26341 | 343 |  |  |  |  |
| 50       | 0.44572                    | 17064 | 23986 | 86844 | 98133 | 357 |  |  |  |  |
| 51       | 0.45818                    | 63426 | 86199 | 52226 | 53233 | 318 |  |  |  |  |
| 52       | 0.50849                    | 05833 | 92445 | 31036 | 71419 | 089 |  |  |  |  |
| 53       | 0.55010                    | 31159 | 32906 | 02708 | 32485 | 867 |  |  |  |  |
| 54       | 0.54529                    | 15267 | 88878 | 36961 | 76398 | 576 |  |  |  |  |
| 55       | 0.49929                    | 83294 | 66241 | 99614 | 21360 | 227 |  |  |  |  |
| 56       | 0.45477                    | 28701 | 94827 | 08670 | 61660 | 020 |  |  |  |  |
| 57       | 0.45225                    | 89692 | 98187 | 61020 | 75946 | 090 |  |  |  |  |
| 58       | 0.49331                    | 04258 | 70790 | 46170 | 16743 | 778 |  |  |  |  |
| 59       | 0.53975                    | 96898 | 54026 | 58435 | 74679 | 725 |  |  |  |  |
| 60       | 0.54917                    | 28343 | 71156 | 41336 | 91662 | 885 |  |  |  |  |
| 61       | 0.51358                    | 50973 | 71291 | 51284 | 15073 | 259 |  |  |  |  |
| 62       | 0.46618                    | 46490 | 42827 | 48925 | 95156 | 654 |  |  |  |  |
| 63       | 0.45038                    | 98102 | 37434 | 21969 | 85256 | 357 |  |  |  |  |
| 64       | 0.48010                    | 44103 | 94744 | 09082 | 00212 | 337 |  |  |  |  |
| 65       | 0.52751                    | 23621 | 55070 | 17331 | 76681 | 660 |  |  |  |  |
| 66       | 0.54909                    | 05218 | 84463 | 34413 | 71882 | 741 |  |  |  |  |
| 67       | 0.52554                    | 20559 | 11094 | 37262 | 06700 | 536 |  |  |  |  |
| 68       | 0.47902                    | 88984 | 85267 | 50275 | 31239 | 347 |  |  |  |  |
| 69       | 0.45233                    | 78517 | 17457 | 93249 | 73496 | 181 |  |  |  |  |
| 70       | 0.46954                    | 28510 | 17320 | 62465 | 64952 | 910 |  |  |  |  |

**Table 10**  
 **$C_2(x)$  to 28 Decimal Places for  $x = 1(1)70$**

| <b>x</b> | <b><math>C_2(x)</math></b> |       |       |       |           |     |  |  |  |  |
|----------|----------------------------|-------|-------|-------|-----------|-----|--|--|--|--|
| 1        | 0.72170                    | 59242 | 92605 | 08777 | 15858     | 156 |  |  |  |  |
| 2        | 0.75330                    | 23754 | 67891 | 16558 | 21899     | 711 |  |  |  |  |
| 3        | 0.56102                    | 03289 | 78138 | 66929 | 91502     | 047 |  |  |  |  |
| 4        | 0.36819                    | 29762 | 80974 | 79631 | 06624     | 017 |  |  |  |  |
| 5        | 0.32845                    | 66248 | 67552 | 60617 | 66040     | 539 |  |  |  |  |
| 6        | 0.44327                    | 38563 | 37623 | 33740 | 30799     | 535 |  |  |  |  |
| 7        | 0.59011                    | 60610 | 93977 | 28750 | 27047     | 081 |  |  |  |  |
| 8        | 0.63930                    | 12479 | 30604 | 90750 | 78986     | 021 |  |  |  |  |
| 9        | 0.56080                    | 39810 | 63954 | 86486 | 90870     | 450 |  |  |  |  |
| 10       | 0.43696                    | 39527 | 29382 | 03550 | 07688     | 183 |  |  |  |  |
| 11       | 0.38039                    | 18718 | 58184 | 33069 | 19940     | 790 |  |  |  |  |
| 12       | 0.43455                    | 73415 | 13101 | 06382 | 98818     | 020 |  |  |  |  |
| 13       | 0.54251                    | 04114 | 00767 | 86698 | 45105     | 819 |  |  |  |  |
| 14       | 0.60472                    | 09589 | 34283 | 43617 | 62030     | 143 |  |  |  |  |
| 15       | 0.56933                    | 60588 | 83420 | 11025 | 14977     | 264 |  |  |  |  |
| 16       | 0.47431                    | 07173 | 20327 | 99317 | 30365     | 277 |  |  |  |  |
| 17       | 0.40798                    | 54159 | 55980 | 92358 | 30735     | 035 |  |  |  |  |
| 18       | 0.42783                    | 71578 | 92569 | 44281 | 65610     | 037 |  |  |  |  |
| 19       | 0.51133                    | 18949 | 15923 | 94675 | 18493     | 394 |  |  |  |  |
| 20       | 0.58038                    | 89720 | 04910 | 94064 | 51525     | 069 |  |  |  |  |
| 21       | 0.57384                    | 06247 | 62014 | 25706 | 02197     | 786 |  |  |  |  |
| 22       | 0.50116                    | 67664 | 65156 | 16986 | 40365     | 593 |  |  |  |  |
| 23       | 0.43066                    | 21163 | 53179 | 33670 | 43223     | 754 |  |  |  |  |
| 24       | 0.42563                    | 49063 | 11197 | 51548 | 13703     | 732 |  |  |  |  |
| 25       | 0.48787                    | 98923 | 51789 | 83957 | 93421     | 219 |  |  |  |  |
| 26       | 0.55862                    | 83863 | 27546 | 46744 | 83741     | 890 |  |  |  |  |
| 27       | 0.57376                    | 57770 | 37074 | 23404 | 53464     | 846 |  |  |  |  |
| 28       | 0.52169                    | 49544 | 71528 | 78657 | 84831     | 103 |  |  |  |  |
| 29       | 0.45183                    | 15477 | 50914 | 35713 | 16176     | 407 |  |  |  |  |
| 30       | 0.42790                    | 80908 | 40306 | 14524 | 17381     | 495 |  |  |  |  |
| 31       | 0.47001                    | 91383 | 09000 | 47664 | 26911     | 705 |  |  |  |  |
| 32       | 0.53794                    | 44618 | 53456 | 89560 | 93373     | 956 |  |  |  |  |
| 33       | 0.56940                    | 72903 | 39672 | 13076 | 90869     | 300 |  |  |  |  |
| 34       | 0.53702                    | 65412 | 69461 | 25664 | 37707     | 963 |  |  |  |  |
| 35       | 0.47201                    | 16032 | 70986 | 94618 | 12969     | 742 |  |  |  |  |
| 36       | 0.43421                    | 19897 | 83205 | 15912 | 46474     | 578 |  |  |  |  |
| 37       | 0.45713                    | 95302 | 72218 | 30841 | 58459     | 369 |  |  |  |  |
| 38       | 0.51835                    | 88947 | 44665 | 75610 | 03439     | 870 |  |  |  |  |
| 39       | 0.56132                    | 10368 | 23016 | 28421 | 80192     | 047 |  |  |  |  |
| 40       | 0.54750                    | 32143 | 63865 | 06819 | 29762     | 110 |  |  |  |  |
| 41       | 0.49087                    | 00405 | 95054 | 71618 | 94969     | 793 |  |  |  |  |
| 42       | 0.44389                    | 70230 | 92958 | 08432 | 69774     | 941 |  |  |  |  |
| 43       | 0.44902                    | 49039 | 25601 | 05219 | 36799     | 969 |  |  |  |  |
| 44       | 0.50038                    | 22120 | 28141 | 13522 | 09821     | 414 |  |  |  |  |
| 45       | 0.55023                    | 87665 | 70790 | 24448 | 70103     | 605 |  |  |  |  |
| 46       | 0.55330                    | 10449 | 49385 | 26102 | 17100     | 530 |  |  |  |  |
| 47       | 0.50780                    | 17801 | 24741 | 49054 | 92799     | 134 |  |  |  |  |
| 48       | 0.45615                    | 97793 | 41237 | 37822 | 41076     | 172 |  |  |  |  |
| 49       | 0.44548                    | 63431 | 58052 | 45336 | 22627     | 428 |  |  |  |  |
| 50       | 0.48465                    | 78973 | 19108 | 24740 | 37663     | 118 |  |  |  |  |
| 51       | 0.53702                    | 44360 | 46413 | 29862 | 68174     | 358 |  |  |  |  |
| 52       | 0.55465                    | 50271 | 56142 | 18161 | 73739     | 417 |  |  |  |  |
| 53       | 0.52216                    | 45976 | 31517 | 94804 | 81338     | 592 |  |  |  |  |
| 54       | 0.47008                    | 79288 | 91381 | 21654 | 77886</td |     |  |  |  |  |

**Table 11**  
**S(x) and C(x) to 28 Decimal Places for x = 1(1)6**

| <b>x</b> | <b>S(x)</b> |       |       |       |       |     |  |
|----------|-------------|-------|-------|-------|-------|-----|--|
| 1        | 0.43825     | 91473 | 90354 | 76607 | 67566 | 966 |  |
| 2        | 0.34341     | 56783 | 63698 | 24219 | 53008 | 160 |  |
| 3        | 0.49631     | 29989 | 67375 | 03609 | 76122 | 653 |  |
| 4        | 0.42051     | 57542 | 46928 | 42444 | 53431 | 407 |  |
| 5        | 0.49919     | 13819 | 17116 | 88675 | 19283 | 805 |  |
| 6        | 0.44696     | 07612 | 36930 | 27762 | 39202 | 878 |  |

| <b>x</b> | <b>C(x)</b> |       |       |       |       |     |  |
|----------|-------------|-------|-------|-------|-------|-----|--|
| 1        | 0.77989     | 34003 | 76822 | 82947 | 42064 | 137 |  |
| 2        | 0.48825     | 34060 | 75340 | 75450 | 02235 | 034 |  |
| 3        | 0.60572     | 07892 | 97685 | 62955 | 61610 | 743 |  |
| 4        | 0.49842     | 60330 | 38177 | 61553 | 07095 | 868 |  |
| 5        | 0.56363     | 11887 | 04012 | 23110 | 21074 | 044 |  |
| 6        | 0.49953     | 14678 | 55501 | 12018 | 82799 | 033 |  |

B L A N K   P A G E

## APPENDIX E

VALUES OF THE ROCKET FUNCTIONS  $rr(x)$  AND  $ri(x)$

**Table 12**  
 $rr(x)$  to 28 Decimal Places for  $x = 1(1)70$

| $x$ | $rr(x)$                             |
|-----|-------------------------------------|
| 1   | 0.80952 54817 47408 84437 07957 597 |
| 2   | 0.64290 39596 19896 52163 18463 093 |
| 3   | 0.54689 05730 71946 22244 14808 288 |
| 4   | 0.48289 41401 75925 91510 32300 344 |
| 5   | 0.43664 99085 67707 70674 44362 460 |
| 6   | 0.40110 42924 03641 95840 07503 263 |
| 7   | 0.37291 81029 38842 08094 75218 618 |
| 8   | 0.34984 06791 01947 67584 61958 551 |
| 9   | 0.33051 22229 54062 42492 68511 861 |
| 10  | 0.31402 71771 57729 61278 61320 242 |
| 11  | 0.29975 70820 42102 17696 53920 582 |
| 12  | 0.28725 08576 48330 44498 57282 972 |
| 13  | 0.27617 65473 28321 18721 75088 888 |
| 14  | 0.26627 94996 08486 15680 27268 433 |
| 15  | 0.25736 86190 92354 95019 46576 842 |
| 16  | 0.24929 06505 03437 93323 20925 053 |
| 17  | 0.24192 38515 20391 99022 67697 142 |
| 18  | 0.23617 04003 37679 36184 51200 161 |
| 19  | 0.22894 99575 48894 48288 10150 742 |
| 20  | 0.22319 61971 37070 16879 81356 583 |
| 21  | 0.21785 37606 00010 25964 92287 313 |
| 22  | 0.21287 60371 75852 92268 16848 830 |
| 23  | 0.20822 34681 93205 78971 87397 061 |
| 24  | 0.20386 22356 16878 45084 78548 812 |
| 25  | 0.19976 32361 88183 50051 62472 303 |
| 26  | 0.19590 12705 98034 55402 41557 422 |
| 27  | 0.19225 43964 77024 92595 62592 194 |
| 28  | 0.18880 34075 41892 22591 69888 096 |
| 29  | 0.18553 14108 71212 15994 75441 831 |
| 30  | 0.18242 34812 19687 58435 72522 904 |
| 31  | 0.17946 63763 36949 14568 47297 488 |
| 32  | 0.17664 83009 75158 59792 77446 574 |
| 33  | 0.17395 87100 73327 39592 17352 162 |
| 34  | 0.17138 81436 38055 43971 34917 309 |
| 35  | 0.16892 80874 95268 21051 73220 011 |
| 36  | 0.16657 08552 45015 87165 56659 428 |
| 37  | 0.16430 94877 16058 08607 09497 297 |
| 38  | 0.16213 76669 37462 07898 74546 343 |
| 39  | 0.16004 96422 16125 84048 74788 081 |
| 40  | 0.15804 01663 59231 43665 31097 748 |
| 41  | 0.15610 44404 37900 09982 07432 153 |
| 42  | 0.15423 80657 73633 21337 62754 006 |
| 43  | 0.15243 70020 58290 33190 87645 769 |
| 44  | 0.15069 75307 03436 49178 60596 825 |
| 45  | 0.14901 62226 65148 18466 26453 352 |
| 46  | 0.14738 99101 12959 77852 53307 175 |
| 47  | 0.14581 56614 12127 94302 46490 700 |
| 48  | 0.14429 07589 71146 68689 98650 358 |
| 49  | 0.14281 26795 74886 68418 75334 633 |
| 50  | 0.14137 90768 80569 84625 30258 220 |
| 51  | 0.13998 77658 01178 04148 15122 773 |
| 52  | 0.13863 67085 40554 53701 05843 250 |
| 53  | 0.13732 40020 77769 44800 47469 281 |
| 54  | 0.13604 78669 26399 85154 92903 086 |
| 55  | 0.13480 66370 18122 94555 79616 398 |
| 56  | 0.13359 87505 80169 83365 24961 205 |
| 57  | 0.13242 27418 93336 64764 12989 654 |
| 58  | 0.13127 72338 31889 17658 44409 687 |
| 59  | 0.13016 09310 99280 29348 56438 095 |
| 60  | 0.12907 26140 83959 17500 54573 581 |
| 61  | 0.12801 11332 70213 33328 58621 229 |
| 62  | 0.12697 54041 44177 95726 67986 712 |
| 63  | 0.12596 44025 45563 01319 99743 327 |
| 64  | 0.12497 71604 18846 71724 11699 542 |
| 65  | 0.12401 27619 24298 34381 73472 286 |
| 66  | 0.12307 03398 73336 56796 05047 184 |
| 67  | 0.12214 90724 56746 71886 19448 497 |
| 68  | 0.12124 81802 37751 84822 31142 085 |
| 69  | 0.12036 69233 84976 57388 67198 257 |
| 70  | 0.11950 45991 23017 21488 40045 180 |

**Table 13**  
 $ri(x)$  to 28 Decimal Places for  $x = 1(1)70$

| $x$ | $ri(x)$                             |
|-----|-------------------------------------|
| 1   | 0.23219 93800 55264 60574 32063 867 |
| 2   | 0.12097 64818 07033 76319 32619 889 |
| 3   | 0.07664 40951 56604 86935 00467 648 |
| 4   | 0.05364 43366 69216 54762 87781 247 |
| 5   | 0.04010 81659 36640 71691 64789 012 |
| 6   | 0.03136 58945 10639 82203 24798 036 |
| 7   | 0.02536 43867 30896 71710 79174 939 |
| 8   | 0.02102 18912 00651 89748 68998 336 |
| 9   | 0.01778 31668 47962 82735 91670 314 |
| 10  | 0.01529 00854 25036 00877 38645 249 |
| 11  | 0.01332 43365 91499 17457 61557 560 |
| 12  | 0.01174 30120 94976 02196 06721 501 |
| 13  | 0.01044 91661 38869 68480 06791 008 |
| 14  | 0.00937 50215 82057 73966 09740 590 |
| 15  | 0.00847 19555 30599 12141 48528 570 |
| 16  | 0.00770 42979 62835 39589 78126 643 |
| 17  | 0.00704 53645 75548 69409 60608 032 |
| 18  | 0.00647 48459 02052 99440 11483 316 |
| 19  | 0.00597 70456 00652 50357 70984 290 |
| 20  | 0.00553 96661 12159 64306 97010 495 |
| 21  | 0.00515 29484 86711 51256 62336 537 |
| 22  | 0.00480 90698 45615 00389 37531 232 |
| 23  | 0.00450 16875 25886 43017 85235 385 |
| 24  | 0.00422 56147 75816 70614 14433 044 |
| 25  | 0.00397 65732 71078 51524 20173 669 |
| 26  | 0.00375 10063 55584 34383 42606 690 |
| 27  | 0.00364 95359 37727 93299 97118 753 |
| 28  | 0.00335 88516 95676 39523 62244 224 |
| 29  | 0.00318 76244 70800 50126 07121 050 |
| 30  | 0.00303 04379 63450 60117 35635 536 |
| 31  | 0.00288 57344 15269 02436 80011 621 |
| 32  | 0.00275 21710 78964 41265 99089 467 |
| 33  | 0.00262 85850 80166 39797 67459 812 |
| 34  | 0.00251 39648 60739 26650 48462 783 |
| 35  | 0.00240 74268 22774 33442 11591 576 |
| 36  | 0.00230 81961 11490 53443 06685 630 |
| 37  | 0.00221 55907 14171 90649 95644 755 |
| 38  | 0.00212 90082 32701 53703 50956 577 |
| 39  | 0.00204 79148 24618 58491 69121 772 |
| 40  | 0.00197 18359 13000 18740 18204 905 |
| 41  | 0.00190 03483 46884 33321 61681 161 |
| 42  | 0.00183 30737 52729 46267 50897 461 |
| 43  | 0.00176 96729 03386 68334 15827 008 |
| 44  | 0.00170 98408 42714 24438 78159 178 |
| 45  | 0.00165 33027 89705 58024 95137 415 |
| 46  | 0.00159 98105 52153 01146 71717 223 |
| 47  | 0.00154 91394 54412 13999 62443 381 |
| 48  | 0.00150 10856 72324 17712 56830 415 |
| 49  | 0.00145 54639 17607 77796 39517 133 |
| 50  | 0.00141 21054 19927 18873 23382 883 |
| 51  | 0.00137 08561 63368 71105 00295 887 |
| 52  | 0.00133 15753 41045 10417 93328 650 |
| 53  | 0.00129 41339 97298 19851 31088 522 |
| 54  | 0.00125 84138 31721 13788 05594 289 |
| 55  | 0.00122 43061 43161 75861 01017 747 |
| 56  | 0.00119 17108 95147 89385 23530 276 |
| 57  | 0.00116 05358 86914 16756 03474 849 |
| 58  | 0.00113 06960 16504 85105 31597 835 |
| 59  | 0.00110 21126 24356 69779 18134 425 |
| 60  | 0.00107 47129 07392 65083 35755 750 |
| 61  | 0.00104 84293 95033 43229 51151 260 |
| 62  | 0.00102 31994 79701 32542 07556 470 |
| 63  | 0.00099 89649 95383 40262 07899 511 |
| 64  | 0.00097 56718 38668 36445 91560 357 |
| 65  | 0.00095 32696 27395 40067 82002 398 |
| 66  | 0.00093 17113 92674 39900 89940 650 |
| 67  | 0.00091 09533 00570 45784 89916 892 |
| 68  | 0.00089 09544 00205 36340 17718 375 |
| 69  | 0.00087 16763 95425 62288 75451 465 |
| 70  | 0.00085 30834 37530 13937 73609 078 |

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## 13. ABSTRACT

The theory of the converging factors for the Fresnel integrals is developed from that of the converging factors for the sine and cosine integrals, and is then applied to the calculation on a CDC 6700 system of tables of these factors and their reduced derivatives to about 35 decimal places. The factors were used in conjunction with appropriately truncated asymptotic series to produce appended 28-place tables of the Fresnel integrals  $S_2(x)$ ,  $C_2(x)$  and of the closely related rocket functions  $rr(x)$  and  $ri(x)$ , for successive integer values of  $x$  from 1 through 70. An abridged 28-place table of  $S(x)$  and  $C(x)$ , for  $x$  ranging from 1 through 6, is also included.

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